INDUSTRIAL REFRIGERATION

LOW COSTS

YOU can count on dependable refrigeration at low maintenance costs when *Texaco Capella Oil (Waxfree)* is your compressor lubricant. This is the oil that *won't precipitate wax* in compressor systems, even at temperatures as low as minus 100° F.

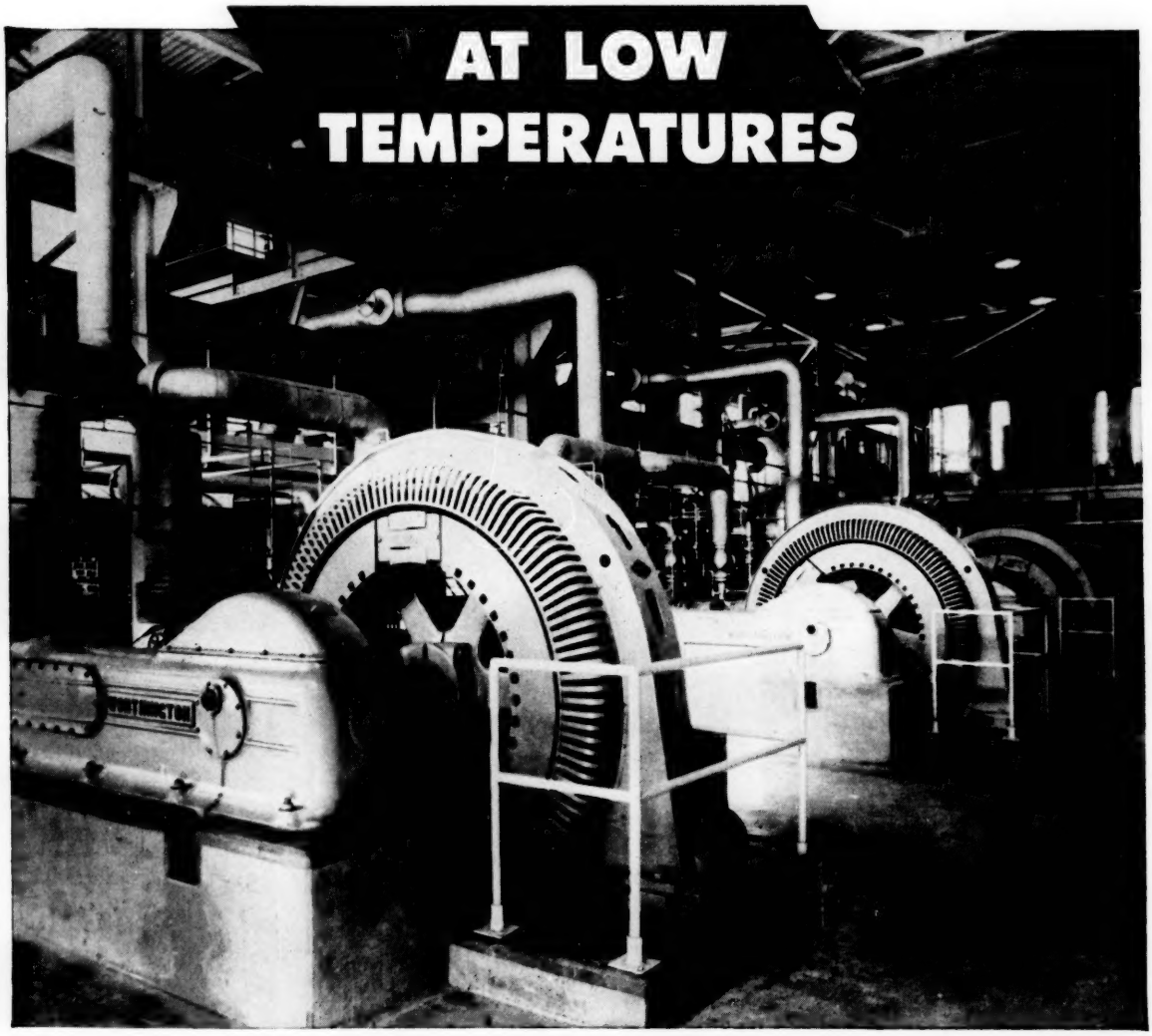
Texaco Capella Oil (Waxfree) is noted for outstanding stability and resistance to oxidation. It will not foam, is moisture-free and compatible with all refrigerants.

The complete line of *Texaco Capella Oils (Waxfree)*—for all types and sizes of compressors—exceeds the requirements of the Freon floc test as well as the specifications of all leading refrigeration manufacturers.

Texaco Capella Oils (Waxfree) come in refinery-sealed 55-gallon and 5-gallon drums, 1-gallon cans—and the most-used grades in 1-quart containers.

A Texaco Lubrication Engineer will help you select the proper ones for your operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

AT LOW TEMPERATURES



TEXACO REG. T.M.

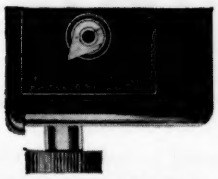
TEXACO Capella Oils (Waxfree)

FOR ALL REFRIGERATING AND AIR CONDITIONING COMPRESSORS

ELECTRIC Heating Cable DEFROSTERS

for LOW TEMPERATURE DOORS

1 • Temperature adjustment control.



2 • Adjustable thermostat for range of +85° to +245° F.

3 • Steel electrical outlet box for making connection between heating element and thermostat—inlet for power.

4 • Rabbeted channels into casing.

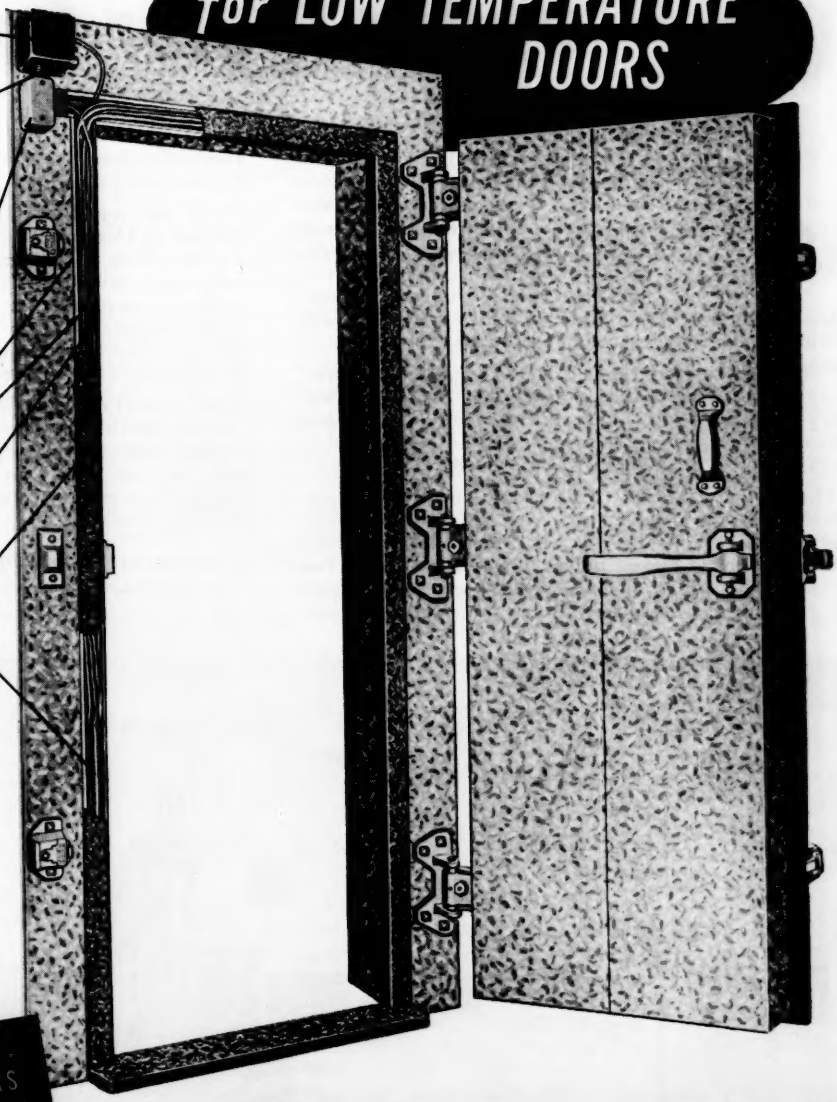
5 • Fireproof No. 26 gauge galvanized metal lined inside channel.

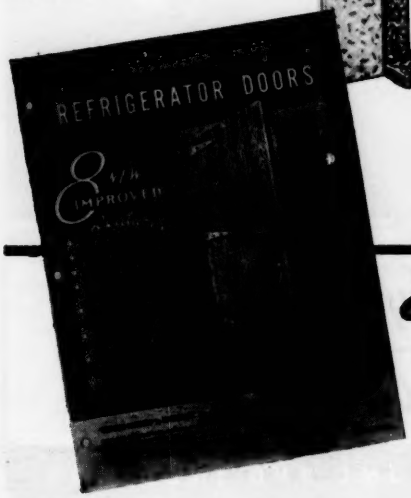
6 • Lead covered "heater cables" (4) held down securely by clips —approximately 20 watts to a foot. (110 volts—60 cycles).

7 • No. 10 gauge galvanized steel cover plates—removable.

8 • Capillary tube controls (on and off) thermostat.

The purpose of heating cables is to prevent icing conditions at the frame and sill areas where the door gaskets make their contact. The cables which are recessed into the frame casing are electrically heated and controlled by a "calibrated thermostat" (new improved feature by Butcher Boy), adjustable above the "dew point" of the air temperature. Since the heat expended prevents condensation it thus prevents freezing conditions.





"Butcher Boy"

QUALITY SINCE 1885

Send

FOR NEW 1956 CATALOG ILLUSTRATING 8 NEW IMPROVED FEATURES

BUTCHER BOY REFRIGERATOR DOOR CO.
1000 Butcher Boy Drive • Harvard, Illinois

Gentlemen:
Send me your new 1956 Refrigerator Doors catalog

Name_____

Firm Name_____

Address_____

City_____ State_____

AIR CONDITIONED STOCKINGS under Taylor Control!

AIR CONDITIONING plays an important part in the manufacture of the high quality full fashion hose for which Bossong Hosiery Mills, Inc., have such a fine reputation. At their Asheboro, North Carolina plant they rely on a Taylor controlled Buensod-Stacey air conditioning system to maintain just the right operating conditions.

"The hosiery business is highly competitive today," says Mr. P. W. Redding, Bossong Plant Engineer, "and it's very important that an air conditioning system meets our exacting requirements and is economical to operate. Top quality controls are essential to do this."

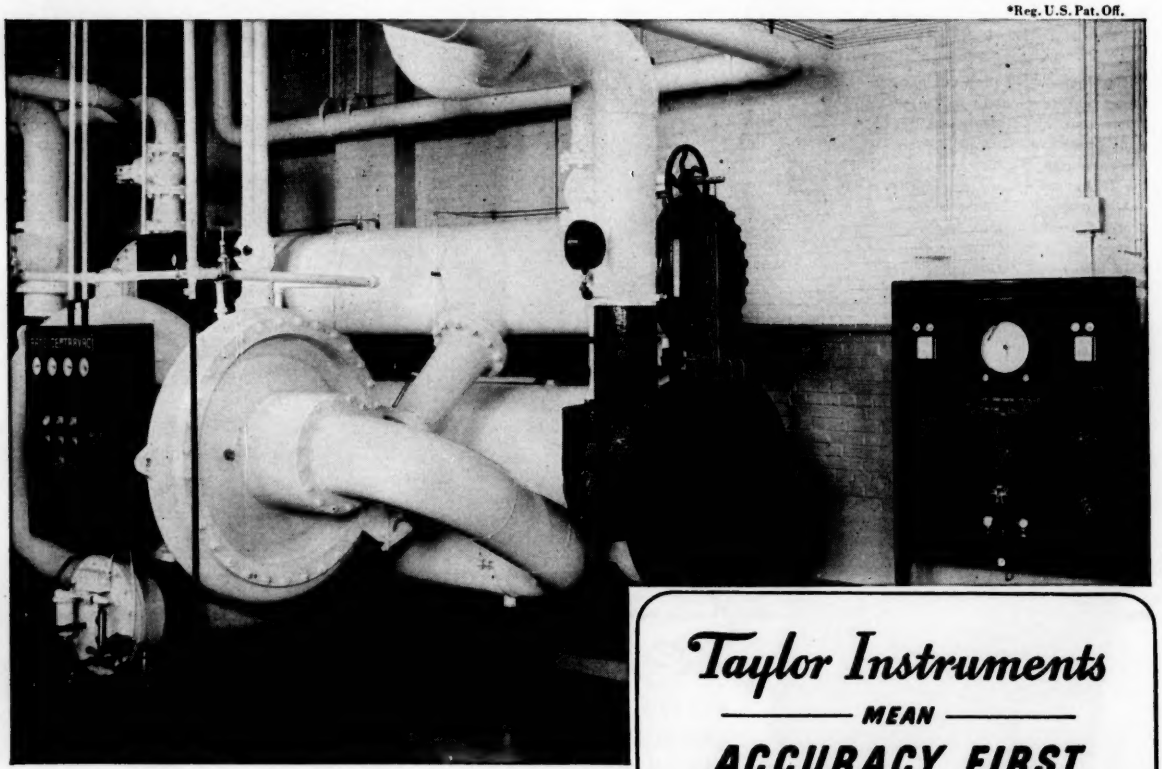
The Taylor FULSCOPE* Recording Temperature Controller with adjustable sensitivity and automatic reset is the main chill water controller. It handles from 10% to 100% loads by positioning inlet vanes on the two compressors, either or both of which are used, depending on the load. Also shown is a Taylor 10RF Pressure Controller operating the relief valve on decrease of load to maintain proper flow through the evaporator.

Other instrumentation (not shown) includes a Taylor Recording Controller with the averaging type of long capillary bulb and automatic reset. It operates outside and return dampers, a steam valve and a chilled water valve with sequence operation. A Taylor Wet Bulb Controller permits economy of operation by using outside air for evaporative cooling until outside conditions rise to the point where refrigeration is needed.

This is one of the many large industrial air conditioning projects on which Buensod-Stacey and Taylor have successfully collaborated. If you have a similar problem why not call your Taylor Field Engineer, or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

*Reg. U.S. Pat. Off.



One of the two-stage centrifugal compressors in the Taylor controlled Buensod-Stacey air conditioning system in use at the Asheboro, N. C., plant of Bossong Hosiery Mills, Inc.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

STAND-OUT

A Hobby Worth Preserving

ANY one seeking a sobering thought in the day's news can surely find it in the prediction of a government official that within fifteen years cooking will be reduced to a mere hobby for American women. The cause for this startling development, according to George P. Larrick, Commissioner of the United States Food and Drug Administration, lies in the recent progress of the frozen food industry. It won't be long, suggests Mr. Larrick, before a housewife's tasks will be confined to thawing out frigid viands and setting them upon the table, there to be devoured by appreciative husbands.

Maybe so. But there are some American males who can bring themselves to consider the prospect only with glumness and reluctance. What, these die-hards may well wonder, would Brillat-Savarin think about it all? "Tell me what you eat and I'll tell you what you are," the famous French gourmet wrote in his book "La Physiologie du Gout." Perhaps he would conclude that Americans are descended from some lost Arctic tribe.

In any case, one hopes that housewives of the future, even as they hand their husbands an ice-pick instead of a fork, will continue to regard cooking at least as a hobby, rather than as a completely useless vestige of a barbarous past. The scent of stew slowly simmering in the pot, the judicious turning of roast beef on the spit, even the sputtering of eggs in the humble frying pan—these are things one hopes will never go the way of Nineveh and Tyre. Have a care, ladies. If present trends continue, some inventive fiend will yet devise a housewife who can be kept in a deep-freeze, to be taken out only when it's time to wash the dishes.

"Frigidinner" Introduced

A NEW products campaign will be launched to advertise the new "Frigidinner" package in Detroit, Washington and Philadelphia, according to an announcement by James T. Jenkins of Frigidinner Inc. The Twin Pak is packed in three selections: roast turkey with dressing and gravy, Swiss steak with mushroom gravy, and pot roasted beef with gravy.

Each pack contains two individual servings, one may be used at a time if desired and the remaining "twin" put back for later use.

Industrial Refrigeration

formerly ICE AND REFRIGERATION
Now in its 65th Year of Publication
J. F. NICKERSON, FOUNDER

Vol. 131 | July, 1956 | Number 1

Contents

Quality Product of Modern Milk Plant Based on Effective Use of Heat Transfer Media 13
Frozen Foods Rate High in Nutritional Value 20
Wisconsin Plant Puts Modern Refrigerated Storage Facility in Service 21
New Slaughter and Processing Plant for Georgia Hospital 22
Technical Papers and Conferences Highlight 52nd Annual ASRE Meeting 23
Snow Ice Used in Concrete Construction 25
Modern Ice Rink Attracts New York Skating Enthusiasts 26
High Velocity Systems a Modern Trend in Air Conditioning 28
What's Ahead in Automation—Survey of Industry Shows Progress 29
Shrimp Boats are Coming — For Ice 30
Perishable Transportation Applications Industrial Refrigeration 54
National Association Practical Refrigerating Engineers 31
Prevention of Refrigerating Plant Failures 31
News Notes and Chapter Activities 43
Presidents Desk 44
NAPRE Question Box 45

Departments

What's New in Equipment ... 4
Press Briefs 8
In the Spotlight 11
Coming Conventions 55
News of People 59
Deaths 60
Manufacturer's News 61
Catalogs and Bulletins 63

The Cover:

Latent heat tanks today are the economic answer to sharp refrigeration demand peaks. Pictured on the cover are the twin 75,000 lb. ice builders employed at Luick Dairy Co., Milwaukee, Wis. Operated in parallel, these tanks provide chilled water for processing up to 300,000 lbs. of milk daily. Three 700 gpm ice water pumps activated by pressure-stats, circulate water at demand. Tanks were set on four inches of Foamglas and covered with two layers of two-inch corkboard and one-half inch Portland cement plaster. Eighteen inches of granulated cork fills the voids between building columns which separate the tanks. See article starting on page 13.

Published Monthly by NICKERSON & COLLINS CO.
General Offices: 433 N. Waller Ave., Chicago 44, Ill. Telephones: AUstin 7-1303-04-05

H. T. McDERMOTT, EDITOR AND PUBLISHER | E. R. CURRY, MANAGING EDITOR | J. R. KELAHAN, TECHNICAL EDITOR | H. D. BUSBY, ASSOCIATE EDITOR

ADVERTISING—O. RHODIUS ELOFSON, DIRECTOR | EDW. DAVIESON, Advertising Representative

HELEN B. SMITH, SECRETARY | E. P. SWANSON, SUBSCRIPTION | V. S. SMITH, PRODUCTION

CHANGE OF ADDRESS—Notify publisher and your local post office promptly of change of mailing address to avoid non-receipt of copies. Copies incorrectly addressed, because of failure to notify publisher, cannot be replaced. Upon request, post office will provide, without cost, convenient "change of address" mailing cards.

INDUSTRIAL REFRIGERATION, Vol. 131, No. 1 Published monthly at 433 N. Waller Ave., Chicago, Ill., U.S.A., by Nickerson & Collins Co. Yearly subscription in the U. S., $2.00 per year; other countries, $3.00. Single copies, 25 cents.

Copyright 1956 by Nickerson & Collins Co. Acceptance under Section 34.64 P. L. & R. authorized.

The entire contents of this journal are covered by general copyright, and special permission must be obtained from the publishers of same before reprinting long extracts or reproducing illustrations; but editors desiring to do so are welcome to use not more than one-third of an article, providing credit is given.

Industrial Refrigeration is indexed regularly by Engineering Index, Inc., and is microfilmed for library use by University Microfilms.

What's New

MACHINERY
APPLIANCES • PROCESSES

V-Belts Reinforced with "Dacron" Offered

INDUSTRIAL V-belts reinforced with "Dacron" are now being offered by E. I. duPont deNemours & Co. These belts were put into commercial production after considerable development work by manufacturers, with the cooperation of duPont's Textile Fibers Department.

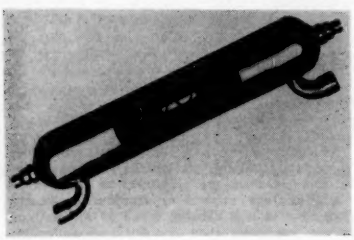
Field testing on production machinery bore out results of laboratory tests that premium belts with "Dacron" are capable of transmitting up to 40 percent more power than belts with conventional fibers. Although premium belts containing "Dacron" cost approximately one-third more than standard belts of identical size and construction, according to DuPont, in many cases they are actually more economical to install and maintain.

On existing drives, direct replacement with belts of "Dacron" polyester fiber may help with many troublesome drives, thus reducing downtime and maintenance costs. On redesigned drives, belts of "Dacron" may permit use of smaller sheaves, thus lowering rebuilding costs and saving valuable equipment space.

Capacity Booster

HIGHER EFFICIENCIES are attained in the new "Heatron" capacity booster for refrigeration and air conditioning systems through the use of "Thermek" spined tubing on the liquid line is the claim of the manufacturer. The inner tube, to which the liquid line is connected, has been machined around and along its outer surface to produce a closely packed array of spines. Heat transfer is said to be increased from 1½ to 5 times over conventional finned surfaces of equivalent diameter. The spines remain attached to the tube and are an integral part of the parent metal.

The booster takes the place of the usual drier loop. By subcooling the liquid, the compressor is made more effective, and the likelihood of excessive flash gas being generated is greatly reduced. Among other advantages according to the manufacturer is increased capacity of expansion valve; 100 per cent of evaporator surface utilized; suction line sweating reduced or stopped; "hunting" reduced by smoother valve operation; overall system capacity increased up to 15 per cent. By installing the booster as a water-cooled condenser, extra cooling may be added to undercapacity, air-cooled jobs.



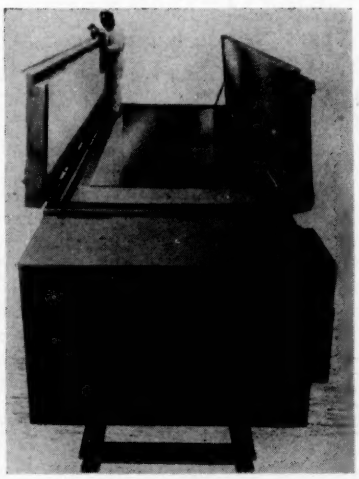
Heatron booster for refrigeration and air conditioning systems.

Shell diameters (outer shell) range from 1⅜ to 2⅛ in.; overall lengths from 12 to 27 in. Liquid line connections may be ¼, ⅜ or ½ in.; suction line connections ½, ⅝, ¾ or ⅞ in.

Rocket Motors Tested Under Low Temperature

A NEW piece of equipment designed to test the performance of rocket motors has been designed by Moore & Hanks, El Monte, Calif., working in conjunction with Pacific Refrigeration Company.

The unit measures 30 ft. x 8 ft. x 6 ft. high. It will handle an internal product load of 7,500 Btu per hour at minus 90 F. For higher internal heat loads at low temperatures, a supplementary liquid CO_2 injection system is provided. Temperature control tolerances are held at a plus or minus 3 F in time and space, according to government specifications for testing of rocket motors.



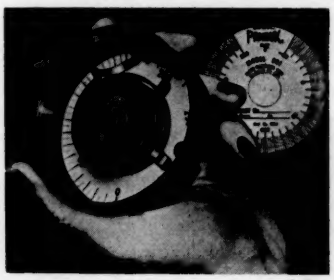
Conditioning box designed for testing complete rocket motor.

The box has an inner liner of aluminum for non-sparking surface and an outer casing of cold rolled sheet steel, providing protection against weather and elements. It requires no additional protective structure or building. Mounted on wide flange steel skids for semi-portability. The boxes are insulated with nine inches of fiberglass and are completely vapor-sealed. Two full top opening doors expose the entire working area (20 x 6 ft.) split at center and opening automatically by pneumatic hydraulic system with partial spring counterbalancing. Conditioning coils of copper tubes and aluminum fins are mounted at one end, with fans mounted above and return air duct run along one side.

Cooling is produced by a cascade type mechanical refrigeration system, using "Freon-13" and "Freon-22" refrigerants and two 7½ hp compressors. A direct expansion cooling coil transfers the heat from within the box to the "Freon-13" refrigerant. The fan motors are mounted externally with special stainless steel sealed shaft assemblies running through the wall. The CO_2 injection system uses 300 psi, zero deg. F liquid for producing supplementary cooling. The liquid CO_2 when sprayed into the air stream becomes a fine snow which then sublimates and absorbs heat. The resulting CO_2 gases are then exhausted from within the chamber. Heating is accomplished by an explosion-proof electric air heater.

Recording Maximum-Minimum Thermometer

A NEW low-cost recording maximum-minimum thermometer has been announced by The Pacific Transducer Corporation, Los Angeles, Calif. This instrument measures ambient temperature and records both the lowest and the highest values over any given period of time. It features a replacable paper chart on which a permanent record of the temperature excursion is recorded. The chart can be quickly replaced and filed for future reference by simply unscrewing the thumb nut in the bottom of the case. The thermometer comes in two ranges, minus 50 to 250 F or minus 50 to 100 C.



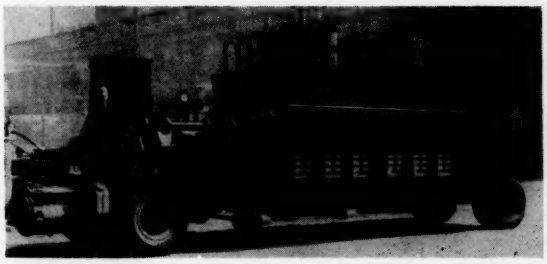
The Pandux maximum-minimum recording thermometer.

A low cost recording themometer of this type has a multitude of uses. Shippers of all types of perishable goods or items affected by temperature, can have a permanet record of the temperatures to which the produce is subjected while in transit or in storage. This may apply to box-car loadings, airplane shipments, truck shipments, etc. It is also ideal for the recording of refrigerator or freezer storage. Accurate records can also be kept of the maximum and minimum temperatures in all types of enclosures, such as hospital rooms, offices, assembly halls, and theatres. An evaluation over a period of time for heating and air conditioning systems may also be accurately obtained.

Portable Water Cooler

A PORTABLE water-cooling tower, developed by Badger Manufacturing Co., Cambridge, Mass., may well prove to be the answer to a number of industrial situations where limited cooling water supplies have been a production bottleneck.

The Badger unit is a complete package plant on wheels. Compact and lightweight, it is equipped with all necessary accessories such as pumps, strainers, electrical control equipment, pressure gauges, thermometers and feed water conditioner. Design capacity of the unit shown in 240 gal per min of 115 F water reduced to 90 F when operating at 95 F air temperature and 80 F wet bulb.



Completely portable water-cooling unit developed by Badger Manufacturing Company, Cambridge, Mass., can be used almost anywhere cooling water is needed. Equipped with all necessary accessories, the unit is ready to go into action on a moment's notice.

The tower is presently being used in conjunction with portable oxygen-generating plants in remote locations. According to Badger, the unit may well answer a need in many water-starved plants at home and overseas. Small chemical plants could use it. So could a small diesel power station with large volumes of cooling water to recirculate.

The tower pictured, is constructed of steel and is packed with 20-inch Fiberglas. The entrainment separator is a special copper mesh, and the four axial flow fans have a capacity of 11,000 cfm each. The entire cooling plant can be shipped as a unit.

Neoprene For Corrosion Control on Cooling Towers

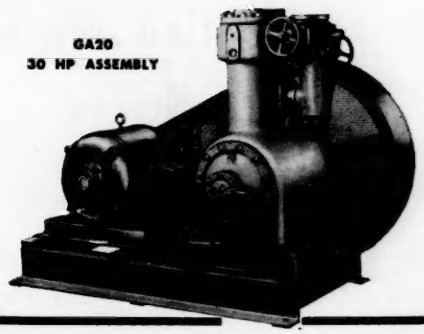
FOR ALMOST 20 years, Neoprene has outlived conventional materials as a covering for underwater cable, as a gasket, or as a lining for chemical tanks. Recently, Neoprene compounds have appeared in the construction field. One of the most interesting and successful applications is in cooling towers.

Skilled workmen from Liquid Plastics Corporation (Progressive Industries) of Long Island City, N. Y. have been applying a lining of Liquid Neoprene to the steel basin of the giant cooling tower atop the 42 story Socony Mobil Building in New York City. This installation is considered by many Engineers as "the answer" to the perplexing problem of corrosion. It is claimed the rubber-like skin permanently bonds to and envelopes steel so that water, vapor or oxygen can not penetrate and attack the metal.

Liquid Neoprene it is said "vulcanizes" into a hard rubber sheet without the costly expense of heat, pressure or sulphur. The material comes in two parts, one part being an accelerator (or catalyst). When mixed, a chemical reaction causes the liquid to slowly "vulcanize" into sheet form. This makes possible *site* application of a cured rubber lining.

At Socony-Mobil the Neoprene was brushed on in four coats to a thickness of 30 mils (.030 inches), which is about the thickness of a dime. The steel first was coated in the shop with a Neoprene Primer the same day the metal was pickled. Although erection of the steel began in August 1955, the original prime coat was enough to completely protect the metal from corrosion over a six month period. Workmen apply the Neoprene with rollers. At 30 mil thickness it requires one gallon of Neoprene to cover 20 sq. ft.

GACO Liquid Neoprene has a record of more than 10 years of useful service in such difficult spots as a lining for tanks containing hot acids and the tail shaft of Navy destroyers.



Another **HOWE** *FIRST!*

HOLDS INSTALLATION COSTS WAY DOWN!

HOWE AMMONIA COMPRESSOR ASSEMBLIES, in capacities to 50 H.P. in both Standard and Booster models, are now factory assembled on steel base with drive and electric motor.

SAVE Special Foundation
SAVE Space
SAVE Installation Labor
SAVE Expensive Belt Guard

The same high quality — medium speed — long life — Howe Compressors are now built into a compact assembly. Makes possible finished installation in a matter of hours after delivery. The experience and know-how gained from 44 years of refrigeration equipment manufacturing backs every HOWE recommendation. Your inquiries are invited.

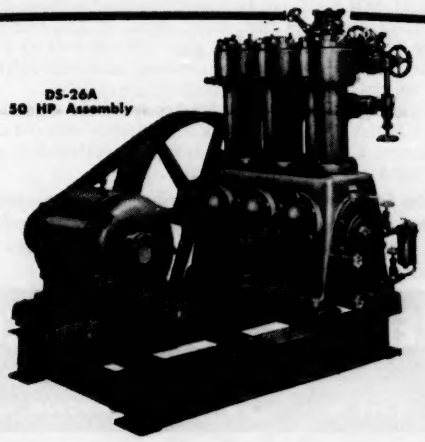
Write for literature

HOWE ICE MACHINE CO.

Distributors in Principal Cities. Cable Address: HIMCO Chicago

2829 MONTROSE AVE. • CHICAGO 18, ILLINOIS

SINCE 1912, manufacturers of ammonia compressors, condensers, coolers, fin coils, locker freezing units, air conditioning (cooling) equipment.



Distilled Water? No... DISTILEX

Distilex renders raw water the same as distilled water for ice making, and increases tonnage production by decreasing the number of hours required to freeze untreated water.

Distilex, safe and easy to use, prevents white butts, and eliminates cracking while ice is being frozen, dumped or cut. Economical — Distilex costs less to use than cracked bar losses.

THE CSCO STABLEIZER MAINTAINS GOOD BRINE

by a positive reaction to either over-acidity or over-alkalinity!

A scientific combination of pure metals upon which damaging materials in brine will "feed" in preference to the brine tank or ice cans, thereby SAVING them!

The CSCO STABLEIZER removes destructive material from the brine without adding harmful chemicals. Easily installed in all systems. No other brine treatment compares in SAFETY! The STABLEIZER does not make brine harmful to workmen's hands. ... protects and preserves expensive equipment!

USE

SOLVEX

FOR COMPRESSOR COOLING SYSTEMS

High head pressures quickly lowered with this remarkable chemical. SOLVEX can be quickly applied without breaking a joint. Removes rust, scale, algae, oil and encrusting matter from condenser tubes and water jackets in one to five days operation. Ideal for cleaning scale and corrosion from boilers, heaters and tanks.

An effective conditioner for spray ponds and cooling towers. SOLVEX goes to work immediately without costly shutdowns. Cooling efficiency is rapidly restored by using one pound per 10 gallons of water.

Write for complete information on these aids to better ice making and cooling, manufactured by the Chemical Solvent Company — makers of quality products for over thirty years.

CHEMICAL SOLVENT CO.

P. O. BOX 487

3005 N. 16th. St. ★ BIRMINGHAM, ALA.

Air Conditioning System Keeps Oysters Cool

AN UNUSUAL air conditioning application, believed to be the first of its kind, permits oysters at the J. H. Miles and Company plant, Norfolk, Va., to lounge in luxurious cool comfort while awaiting shucking. Previously, the oysters were stored on ice overnight, still in their shells, until they could be shucked and packed the following day. This cooling method has now been replaced by an air conditioning system.

Piling oysters over perforated pipes in J. H. Miles plant, Norfolk, Va.

As they are unloaded from the oyster boats, the bivalves are piled over perforated pipes on the storage room floor. Cold air is forced through the pipes and permeates the piles of oysters, keeping them cool and fresh until the next day's shucking. Cold air is also supplied into the space through grilles.

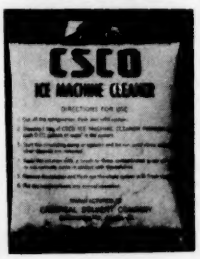
Two specially-designed Marlo ceiling type air conditioning units supply the cooling. Each unit has an air volume of 4000 GFM at 4 inch external static pressure. The units are arranged with stainless steel shaft and hot dipped galvanized casing, with 1 inch of waterproof insulation.

This plant actually has a 75-ton chilled water installation. This 75-ton capacity is used during the processing to keep the oysters properly preserved. This water cools the vats and the cleaning water for the oysters. The air conditioning for the storage area, operates a large part of the time when the processing is not in operation. The capacity requirement for the air conditioning of the storage area requires approximately 30 tons. This air conditioning system is used over the weekends and sometimes at night to preserve the oysters that are stored for shucking and processing.

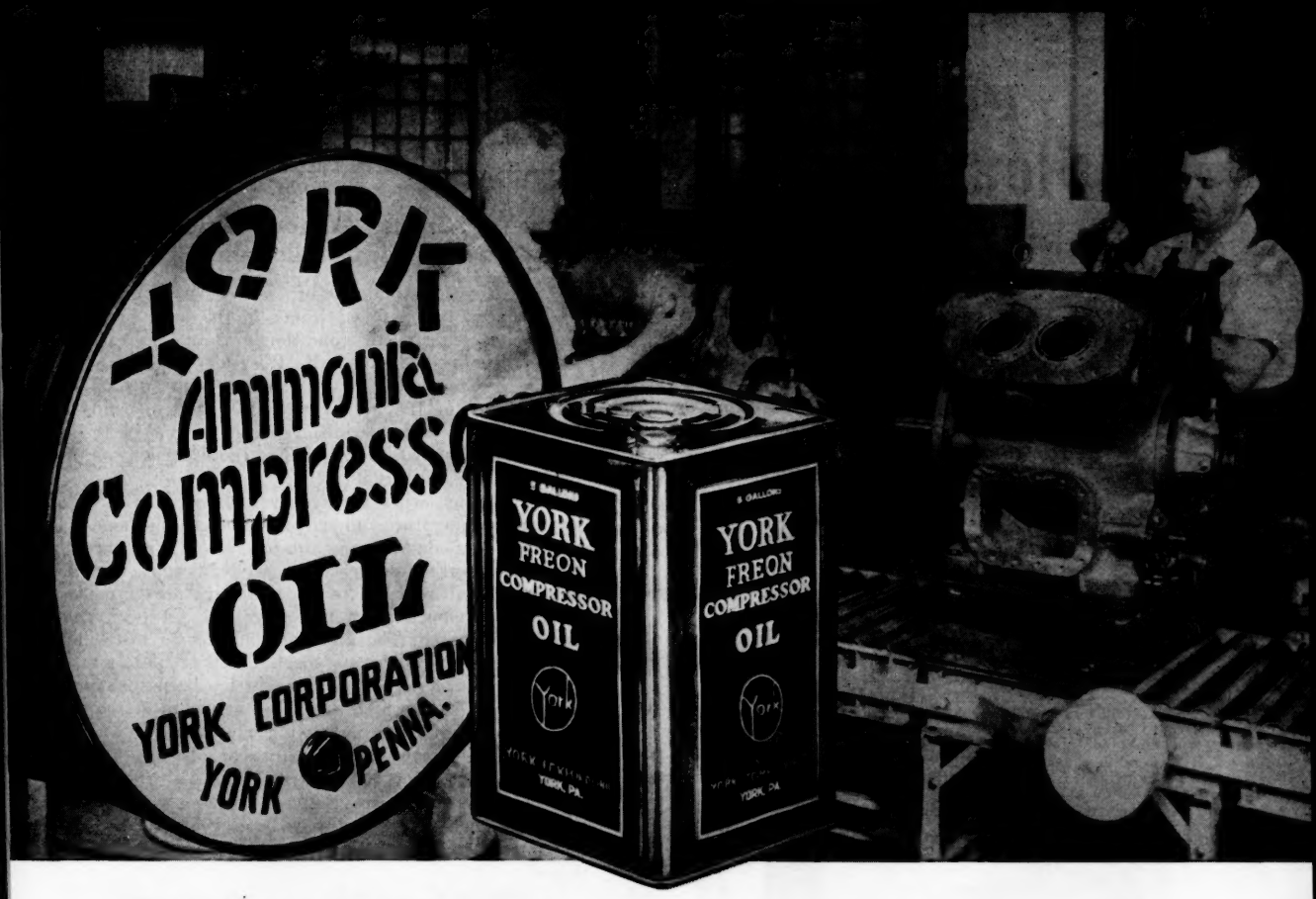
There are two Marlo air handling units. Each unit operates half of the storage area with part of the air being fed in the open area through grilles and the large part of the air being fed through perforated piping in the bottom of the oyster bed.

Baker & Company, Norfolk, Va., designed and installed the system.

CSCO Cleaner Bags Carry Printed Instructions



CONVENIENT printed directions for use are now being printed on each safe-to-handle bag of CSCO Ice Machine Cleaner Powder. One polyethylene bag of the cleaner powder is normally sufficient for cleaning two small ice-making machines or one 300-pound-per-day machine. In addition to cleaning all types of ice-making machines, this product is also effective and safe for removing scale and other deposits in institutional dishwashing machines and ice plant blower tubes. CSCO Ice Machine Cleaner Powder is one of the products of the Chemical Solvent Company, manufacturers of chemical cleaning materials for industrial and institutional use for over twenty years.



Behind York Oil Quality:

EXPERIENCE in manufacturing compressors

York Compressor Oils are the only oils on the market developed and produced by a leading manufacturer of refrigeration compressors

For over 30 years York has been producing oils specifically compounded and refined for the special requirements of refrigeration and air conditioning equipment. The knowledge and experience gained from these years of service and maintenance for such equipment helps York produce the very best in Refrigeration Compressor Oils. *Any* make of compressor benefits from their use.

York Oils are super-refined to withstand *both* high and low operating temperatures and bearing pressures under which they must lubricate moving parts of a refrigerant compressor. York Oil keeps compressors free of carbon on valves and gummy deposits on piston rings. It is chemically stable, bone dry, won't break down.

All over the world, trouble-free operation of hundreds of thousands of compressors lubricated with York Oils provides overwhelming evidence of York Oils' superior quality and ability to function perfectly under widely varying conditions.

YORK OIL IS STOCKED AT ALL YORK CORPORATION DISTRICT WAREHOUSES.

It always pays to use York Accessories & Supplies:

AIR FILTERS • AUTOMATIC CONTROLS • BRINE TESTING SETS • CHARGING CONNECTIONS • COILS AND PIPING • COLD STORAGE DOORS FREON REFRIGERANTS • GAS MASKS • ICE CANS • ICE PLANT ACCESSORIES • MOTORS • PUMPS • OILS • OIL TRAPS • PURGE DEVICES RECEIVERS • SUCTION TRAPS • VALVES AND FITTINGS

York refrigeration air conditioning

the quality name in refrigeration oils

HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885

YORK CORPORATION

PHILLIPS
Float Controls

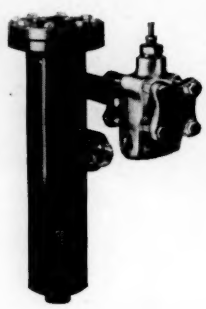
Modulating Valve Action Gives Smoother, More Efficient Operation

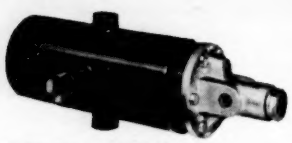
Phillips Controls continuously adjust refrigerant flow to the refrigeration load. *All* the evaporator tubes are kept wetted *constantly* to produce the best heat transfer rate of which your equipment is capable. "Hunting" in system is eliminated, thus compressor loads are even and maintenance is kept low. Check the following against your own requirements.

REMOTE FEED VALVES

No. 101 Remote Feed Valve with Float Chamber for Ammonia or Freon.

For shell and tube type coolers, large room coils and various types of tank coils. Float with adjustable level located in chamber outside the evaporator; "Level-Eye" with Frost Shield on chamber shows normal liquid level. Capacities to 50 tons for ammonia, 12 tons for Freon.





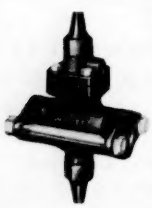
No. 301 Remote Feed Valve for Ammonia or Freon.

Cartridge-type unit for easy replacement of needle and seat. Float chamber (equipped with "Level-Eye" with Frost Shield) connects to evaporator with balance or equalizing lines. Capacity to 50 tons ammonia and 10 tons Freon.

PILOT OPERATED FEED VALVES

Phillips Pilot Float Valve with level adjustment and "Level-Eye".

Pilot operation of valve permits higher capacities to be handled with modulating-type control. Can be operated by Phillips Pilot Valves, thermal expansion or solenoid control. Models for both high and low side installation. Capacities from 1 to 1000 tons for Freon, 1 to 2000 tons ammonia.



Phillips Pilot Operated Feed Valve

Write for full details and typical hook-up drawings.

PHILLIPS **H. A. PHILLIPS & CO.**
DESIGNERS AND ENGINEERS
REFRIGERATION CONTROL SYSTEMS

3255 W. Carroll Ave. • Chicago 24, Illinois

PRESS BRIEFS

New York Transit Authority Announces Experimental Air Conditioning

THE Transit Authority of New York City has announced that a "cool front" in the form of an experimental ten-car, air conditioned train was expected to circulate through the I. R. T. system beginning July 1. Whether the test train will ultimately mean total air-conditioning of the authority's 6,200 cars depends on the success of the experiment. But it became clear that large-scale installation of cooling equipment was not likely at best until 1958.

Last summer, when the agency first began to think of lowering temperatures on its rolling stock, the hope was to install air-conditioning equipment on 250 cars by 1957. Last year's tests were inconclusive because they did not get started until late in the summer. And the devices installed developed flaws that have not yet been completely eliminated. The plan last fall was to install air-conditioning machinery on the last 250 of 650 I. R. T. cars then on order. But this idea now has been abandoned and the new cars, which are being delivered at the rate of forty a month, have no cooling equipment.

Some time in June the authority will advertise for bids for 250 additional I. R. T. cars in line with its over-all car replacement program. Delivery on them would not be made until late next year or early in 1958. If this summer's tests are successful, these cars may be air-conditioned.

In addition to air-conditioning new cars, Charles L. Patterson, the authority chairman, is thinking in terms of cooling older equipment. But this is an even longer-range program. The first cars to get the devices would be the newest cars in service. They come up for heavy overhaul every five years. Thus it would be 1960 and later before the newest rolling stock in service would be outfitted.

The equipment for the ten-car experimental train, which will see service on both the East and West Side lines of the I. R. T. this summer, was produced by the Vapor Heating Corporation of Chicago, Ill. In addition, the authority will test equipment provided by the Frigidaire Division of General Motors on a single I. R. T. car after July 1. Four cooling units will be installed at a cost of $4,917 by the St. Louis Car Company, builder of the new I. R. T. cars.

Illinois Bell Telephone Pushes Air Conditioning

INSTALLATION of air conditioning equipment by the Illinois Bell Telephone Company in 36 additional buildings is now in progress and will be completed by the end of this year. When this work is finished, about 47 percent of company space will be conditioned. This includes all space since the air conditioning program was started around 1947. Spaces being air conditioned under this years' program are those which, in the judgment of the departments, need it most.

A progress report for the year indicated that in June, air conditioning equipment was scheduled to be working in all operating rooms in these buildings in the Chicago area: Rogers Park, Oakland, South Chicago, Lafayette, Superior, Claremont and Lakeview. Work to air condition all other operating rooms will be started later this year.

Progress in the buildings in other areas varies from 25 to 100 percent complete now, but all equipment will be operating by June in these locations: Barrington, all space; Centralia, all space; Champaign, operating rooms in building addition to central office and business office; Dwight, all space; East Chicago, two operating rooms, all plant equipment space and wire chief's space; Edwardsville, business office; Evanston, all space except district offices and some traffic quarters; Forest, toll office; Gary (North), entire building; Highland Park, operating room and traffic service observing; Lewistown, plant equipment space and operating room; Lockport, all space; Morris, all space; Rock Island, entire building; Sterling, operating rooms, traffic quarters and wire chief space; Springfield, business office, operating room, plant test and assignment space; Urbana, business office; Vandalia, business office; Watseka, entire building.

These projects to be completed in 1956, also have air conditioning: Marengo business office; new dial buildings at Hinsdale, Downers Grove, Deerfield, Wilmette and Bensenville; building additions at Wheaton, Oak Lawn, Arlington Heights and Blue Island.

Kroger Expansion Planned

PLANS FOR a multimillion dollar expansion by the Kroger Company, including a huge food distribution center in Livonis and 80 new stores in southeastern Michigan have been announced by C. Olaf Talla, Detroit area general manager. The distribution center, described as the world's largest, will be built on a 75-acre site.

The center will include lockers with space to store 50 carloads of frozen food products, a meat distribution plant with space for 60 carloads of fresh meat at proper temperatures, and air-conditioned facilities, with temperatures maintained by air curtin doors, for handling fresh fruits and vegetables. Work will start on the center early this summer and part of it will be in use by fall.

California Fruit Company Plans New Warehouses

PLANS are being prepared by Los Angeles Architect Leo P. Raffaelli for construction of two refrigerated warehouses in Di Giorgio, 20 miles south of Bakersfield, Calif., for the Di Giorgio Fruit Company, one of the largest shippers in the United States. The two steel frame insulated structures will be 400 x 140 feet and 100 x 200 feet in area and will be used for the storage and precooling of grapes, peaches, apricots and other fruits and vegetables.

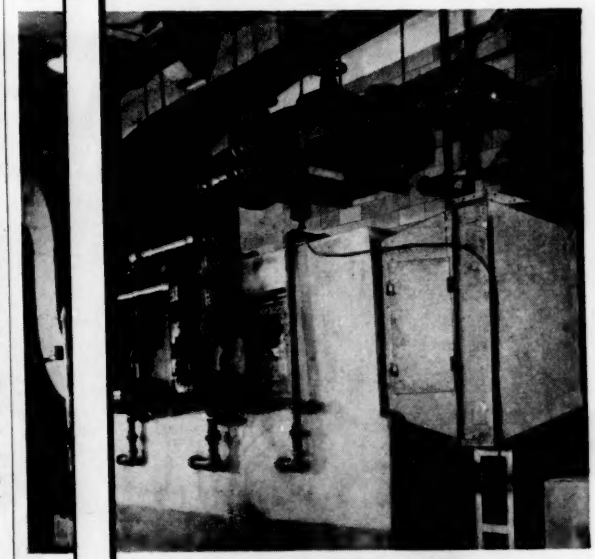
The warehouses will be completely equipped with conveyor handling systems, sprinkler systems, refrigeration plants and related facilities. No estimated cost of the project is yet available, but it is understood that it will be a half million dollars.

Frozen Dutch Cheese good After 44 Years

A DUTCH cheese which lay buried for 44 years in a cache of supplies under the snow and ice of the Antarctic was discovered recently and eaten by members of the U. S. Task force with Admiral Richard E. Byrd. Buried by the British explorer, Capt. Robert F. Scott in 1912, the cache was unearthed last month. The cheese a round Edam manufactured in Holland in 1909 or 1910, was declared edible. It had maintained its "excellent taste," though it had become somewhat "crumbly". The latter is characteristic of very old Dutch Edam cheese. Originally packaged for the tropics, the cheese was double-wrapped in tin containers with other items.

GENUINE OZITE

PIPE COVERING INSULATION



CUTS POWER CONSUMPTION

- APPLIES EASILY WITHOUT WASTE
- LOW CONDUCTIVITY FOR EFFICIENT HEAT BARRIER
- ALLOWS CLOSE TEMPERATURE CONTROL
- LASTS A LIFETIME

OZITE All-Hair felt is easy to install for curves, straight pipes or valves... applies without waste ...provides maximum capacity of refrigeration units... Ozite is practically indestructible.

Write for Bulletin No. 300

No shape is too complex

AMERICAN HAIR & FELT CO.

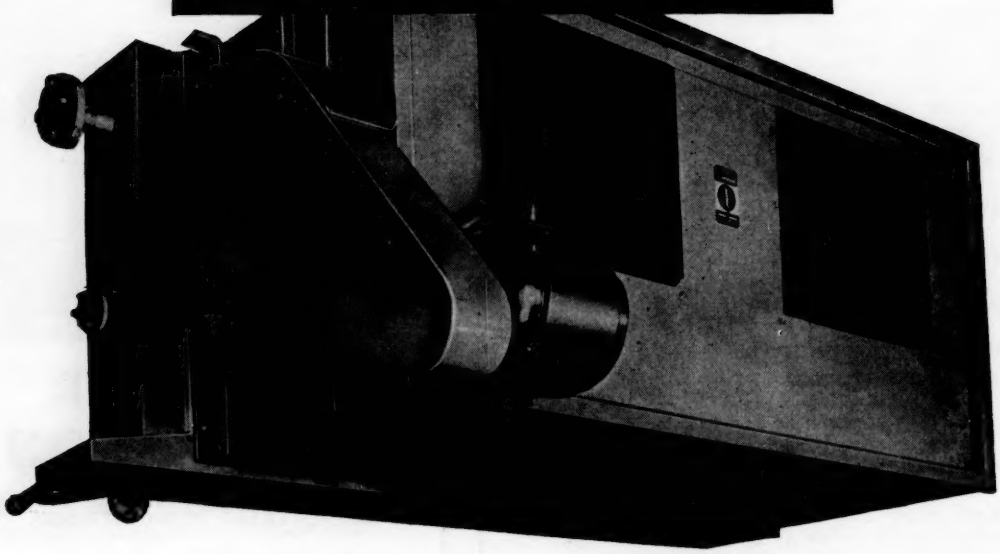
MERCHANDISE MART • CHICAGO 54, ILLINOIS

Announcing...

Extra-Large

CAPACITY

THERMOBANK



for FREON and AMMONIA

NOW...no job is too large for the KRAMER THERMOBANK

The only completely automatic system for freezing temperatures offering these extra large capacities. THERMOBANK requires no manual attention whatsoever.

Ceiling mounted, THERMOBANK takes no precious floor space. You can store products directly under the unit.

Can be used as an independent system or with an existing large system without affecting the operation of other evaporators.

WRITE FOR BULLETIN 294-6

KRAMER TRENTON CO. • Trenton 5, N.J.

In the Spotlight

DAIRY PLANTS specializing in milk processing use refrigerating media at various levels of temperature. Like their ice cream manufacturing cousins, the dairy delivery firms find economic advantages in three or more distinct systems. Luick Dairy Co., Milwaukee's newest milk plant, uses well water, chilled sweet water and liquid (direct expansion) ammonia to help market the best quality product in an increasingly competitive field. See cover legend on page 3 and illustrated article starting on page 13.

RESEARCH on the nutritional value of frozen foods, launched in 1953, resulted in startling findings released at the recent National All Industry Frozen Food Convention. The report gives a high rating to frozen foods for their consistent quality, flavor and nutritional content. For report on the survey see page 20.

THE MOHAWK Refrigerating Company, Milwaukee, Wisconsin, has completed a new refrigerated warehouse, with basement and two floors. It is the first unit of a potential 10-unit building in a new food distribution center serving the Milwaukee trading area. The new plant is expected to become the central warehouse for all retail packaged frozen foods, convenient to highway transportation. For description and pictures, see page 21.

TECHNICAL PAPERS and Conferences were important features of the 52nd annual meeting of the American Society of Refrigerating Engineers held at Cincinnati, Ohio, June 4 to 6. Report of the meeting starts on page 23.

SNOW ICE has been found useful in strengthening concrete in heavy construction by preventing cracks. From San Francisco comes a story on how this method was used. See page 25.

ICE SKATING rinks call for modern piping and refrigeration as well as competent engineering. The Low-Tor Ice rink located in a resort area of Rockland County is an adjunct of the Garnersville Ice Company plant and utilizes the same compressors. For description see page 26.

DON'T be too worried about these automation ideas making workers obsolete. Like all other great inventions — from the cigaret machine to TV — they still need somebody standing by to kick them when they refuse to work. — Lee County (Ala.) Bulletin.

AUTOMATION is receiving attention by both large and small industrial plants, but they are not too hopeful of achieving any sizable proportion by converting existing equipment. The heating, ventilating, air conditioning and refrigeration industries expect it to show mostly in welding operations and materials handling. This is revealed in a survey conducted by The American Society of Tool Engineers, summarized in the article starting on page 29.

SHRIMP ON ICE is accomplished by a modern screw-conveyor system at Port Aransas, Texas operated by The Harbor Ice Company. Tubular ice is loaded automatically on Gulf shrimp boats at a peak rate of 60 tons per hour. For description and pictures, see page 30.

INSURANCE inspection services provided by leading underwriters are thorough and systematic. Their detailed reports of accidents pin point causes. INDUSTRIAL REFRIGERATION for this reason, has reproduced papers from such insurance publications as *The Locomotive,* which deal with causes of accidents and plant failures. NAPRE took a cue from the articles published in October, 1955 and April 1956 issues of IR which laid the blame for 53 percent of machinery failures on the operators. At NAPRE's Educational Conference, it was decided to publish six articles on operating and maintenance of refrigerating compressors and their electric motor drives. Objectives — to help the operator improve his knowledge and handling of this equipment, and to make him conscious of good maintenance practices. First of these, "Prevention of Refrigerating Plant Failures — The Electrical Maintenance of Switchgear, Starters and Motors", starts on page 31.

MORE MECHANICAL refrigeration units are being applied to the high and low temperature refrigeration of perishables. The point is made by a refrigeration engineer that these applications should be classed as industrial refrigeration because they are used in mass transportation. For his point of view see article on page 54.

HOME COOKING will be reduced to a mere hobby for American housewives within fifteen years, predicts a government official. He points out that the recent progress in frozen foods points to a future in which frigid viands need only be thawed and set upon the table. Whether the American husband will view a future, in which he is handed an ice pick instead of a fork, with anything but glumness, constitutes a question which may be a damper on this newer idea of home cooking.

UP Your ICE Production With

Templets

REG. U.S. Pat. OFF.

Thousands of ice manufacturers throughout the country know from actual experience the super qualities TEMPLETS contribute, when added to raw water, in making quality ice and increasing production. They've used them for the past quarter of a century and have no thought of discontinuing their application. The re-orders we receive from these satisfied manufacturers prove conclusively that TEMPLETS are a highly esteemed product.

To the ice manufacturer who has never used TEMPLETS, may we explain that this product is a tempering ingredient that is made up in the form of a little green tablet. Two or three TEMPLETS dissolved in a can will improve the quality of your ice and leave no taste, no odor, no color.

TEMPLETS make your ice stronger and reduce its tendency to crack during cutting or scoring, and also give you a clearer cake. White butts, heavy cores and the cloudy veil that your customers don't like can be completely or partially eliminated. TEMPLETS clear your ice of imperfections caused by raw hard water.

With TEMPLETS you can make more ice during the peak summer months in the same number of cans, thus increasing your daily production. TEMPLETS reduce cracking and breaking in the cakes, enabling you to freeze raw water at lower brine tank temperatures so you can use your cans more often and make more ice.

Start using TEMPLETS today. Once you've tried them you'll never again manufacture ice without them. They are very economical . . . cost you only about a penny a ton of ice!

Convince yourself how really good TEMPLETS are by trying them in your own plant at our expense. We will be happy to send you a sample of TEMPLETS absolutely FREE and with no further obligation if you will but send us the coupon below.

BARADA & PAGE, INC.

Kansas City 20, Missouri

Guinotte and Michigan Aves.

SEND TODAY FOR YOUR FREE SAMPLE

B-P

Barada and Page, Inc.
Guinotte and Michigan Aves.
Kansas City 20, Missouri

Please send me a free sample and literature on TEMPLETS.

Name.....

Company.....

Address.....

City..... State.....

Luick Dairy Company milk plant is designed along simple, attractive lines, but highly functional in its plant layout and engineering design.

Quality Product of Modern Milk Plant Based on Effective Use of Heat Transfer Media

MILK processing in the modern metropolitan dairy delivery plant may involve all high temperature refrigeration as compared with the combination milk and ice cream plant with its three or four low temperature levels, thereby implying simplicity of design and operation. However, this is far from fact. The modern milk plant must utilize all advantages offered by various heat transfer media in order to provide management with every opportunity to bring a better quality product to the consumer at a competitive price.

Luick Dairy Company of Milwaukee, Wisconsin, a Sealtest dairy, employs three methods of refrigeration to accomplish what is believed to be the most economic refrigeration application in handling up to 300,000 pounds of milk daily. Well water is utilized for its refrigeration effect before being passed through the condensers. Sweet water is chilled and used as an intermediate temperature refrigerant in many of the processes. Ammonia is used for direct expansion requirements. Each is applied where temperatures and operations are such that its use will promote optimum in system and/or personnel efficiency.

New Milk Plant Addition Second Construction Phase

In 1951 Luick Ice Cream Company moved from its old Sixth Street location to a new 12-acre site at East Capitol and Holton Streets in Milwaukee. A modern "push-button" ice cream plant was completed on that site. Since its opening in March 1951, production capacity has been increased by 40 percent. Additional freezers, hardening rooms, and miscellaneous process items have been added, but no additional refrigerating equipment has been needed.

The new dairy company plant at Luick's, completed in December 1955, is located on Holton Street adjacent to the ice cream facility. Although the ice cream and the dairy plant are separate enterprises—even to the extent of separate refrigeration systems—electric power, steam, and well water utilities for the milk plant are provided through the ice cream plant substation, boiler plant and wells, respectively. As with the ice cream production, Luick's anticipated these utility needs and designed for them.

The new dairy plant refrigeration equipment consists of three Vilter VMC compressors, a liquid recirculating system and two ice builders for latent heat applications of circulating ice water in the processing functions. Two condensers, a receiver, suction trap, six Niagara's and a Krack cooler, plus the associated controls, pumps, instruments and electrical apparatus, completes the refrigerating facility. The plant is automatic in operation.

Direct expansion ammonia is utilized in the two ice builders, milk storage room, the four "Pure-Pak" machines and Lab sample cooler. Other process units utilize indirect cooling with the chilled sweet water. The raw milk storage tanks, the high-temperature short-time pasteurizers, the various batch pasteurizers, cheese vats and pasteurized storage are all serviced by this system. In addition, the chilled water units in the air conditioning system for the laboratory and the offices are refrigerated from the ice water system. Well water is used in the air conditioning system for process areas, before it is used in the condensers. Some well water is used for the first effect in the batch pasteurizers and then wasted.

Milk Plant Operations

A modern metropolitan milk plant like Luick's receives the raw milk from their farmer suppliers, pasteurizes and processes the fluid and then makes wholesale and retail deliveries of the product. Refrigeration is employed in more than half a dozen of the operations involved. See Table I. The raw product is received in bulk tank trucks such as pictured in Fig. 1, and in milk cans in insulated refrigerated trucks. With expanded rural electrification the dairy industry has encouraged and promoted the use of bulk farm tanks for cooling. With the adoption of these units more and more tank trucks are being employed. Luick expects their entire raw milk needs to be delivered in such vehicles by the end of 1956.

Fig. 1 — Milk is received in stainless steel tank trucks and pumped into the raw milk storage. Tank truck is insulated but not refrigerated. The pump on the truck is for transferring milk from refrigerated farm tanks to the vehicle.

Luick's plant is equipped for both bulk receiving and can shipments. The can receiving station is expected to be converted to a second tank truck receiving line. The raw product from both receiving stations is stored, after laboratory sampling, in holding tanks.

The new dairy plant is equipped with six cylindrical raw milk tanks of 3,000 gallon capacity and two rectangular tanks of 7,000 gallons. These tanks arranged in a stainless steel bulkhead along one side of the process room, are all refrigerated by coils containing circulating chilled sweet water. Four of these tanks are visible in Fig. 2.

Indirect Refrigeration For Pasteurizers

Batch pasteurizing of milk for by products is accomplished in tank type units utilizing both well water and sweet water for indirect cooling. The well water takes the initial shock of cooling and the chilled sweet water is used for finishing. Tanks are equipped with coils and insulated for this purpose. See Fig. 3.

Raw milk for consumer consumption, the principal product of this plant, is pasteurized by means of three high-temperature short-time pasteurizers. Each pasteurizer is equipped with its own individual control panel regulating the high temperature and low temperature applications, as shown in Fig. 4. The low temperature application or cooling of the heated product is accomplished with chilled sweet water. One HTST pasteurizer is capable of handling 25,000 pounds of milk per hour, while the two smaller units are rated at 12,500 and 10,500 pounds per hour. Together they have a refrigeration demand of over 200 tons.

Cheese Making

Fresher and tastier cottage cheese manufacturing is the objective of Luick's. They accomplish this in the cottage cheese operations occupying the larger portion of the mezzanine floor located above the main process area (see Fig. 3). Five cottage cheese vats are used in this major by-product operation such as pictured in Fig. 5. Three 18,000 gallon cheese vats, one 9,000 and one 5,000 utilize chilled sweet water for cooling. By locating the vats and associated starting tanks on the mezzanine floor the firm is able to employ a filling operation involving gravity flow. Once the cheese making is completed and the product is creamed, it flows to a hopper in the mezzanine floor. Filling operations are from the hopper spigot on the main process floor beneath.

Milk-filling operations on the main floor are accomplished with five other units. Four of them ("Pure-Pak" as shown in Fig. 6) are paper carton operations and one a glass operation with a bottling machine.

Direct Expansion NH_3 For Carton Fillers

Of the total six packaging units, only the four "Pure-Pak" machines

TABLE I—REFRIGERATION APPLICATIONS AT THE NEW LUICK DAIRY CO.—FROM RAW MILK THROUGH PASTEURIZING TO DELIVERED PRODUCT.

Process or Operation	Equipment Involved	Refrigeration Effect By:
Receiving	8 Tank Trucks, Insulated	Not Refrigerated (Bulk Farm Tank Cooling)
	Can Trucks, Insulated Bodies	Eutectic Plates (Cans, Farm Cooled)
Holding	Insulated raw storage tanks 6 Cylindrical, 3,000 gal. 2 Rectangular, 7,000 gal.	Chilled Sweet Water
Pasteurizing	3 Batch Units 1 — 2,000 gal. 1 — 1,000 gal. 1 — 500 gal.	1st stage: Well Water 2nd Stage: Chilled Sweet Water
	3 HTST Units 1 — 25,000 lbs./hr. 1 — 12,500 lbs./hr. 1 — 10,000 lbs./hr.	Chilled Sweet Water
Cheese Making	5 Cottage Cheese Vats 3 — 18,000 gal. 1 — 9,000 gal. 1 — 5,000 gal.	Chilled Sweet Water
Filling	6 Packaging Units	
	4 Pure-Pak (Paper)	Direct Expansion, NH_3
	1 Bottling (Glass)	None
	1 Cottage Cheese	None
Storage, Milk	64 × 172 × 12 ft. room 6 Niagara Units 12,300 cfm each 10 tons each	Direct Expansion, NH_3
Storage, Paper	27 × 108 × 12 ft. room 40 % rh & 90 F	From A/C System
Delivery	Wholesale Trucks Insulated	Blower Units, & Electric-Driven (Plug-in) Fluorinated Hydrocarbon Compressor Units
	Route Vans Insulated	No Refrigeration Products Iced

Fig. 2 — Main processing room showing by-products processing. Tank in foreground is 2,000 gallon skim milk tank. Tanks in stainless steel bulkhead are 3,000 gallon cylindrical raw milk storage tanks. Stairway leading to the mezzanine is sanitary all-stainless steel construction.

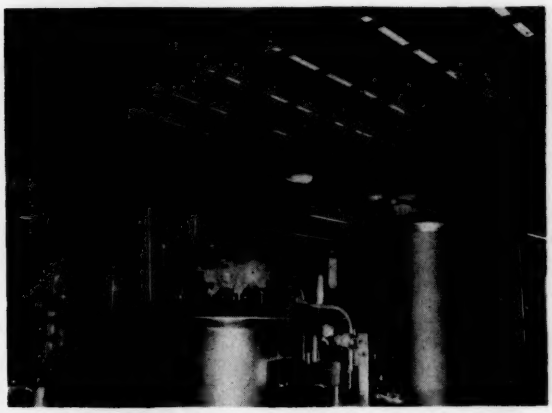


Fig. 3 — View of the mezzanine as seen from the processing room floor. Slots in architecturally exaggerated longitudinal beam indicate the presence of the air conditioning. The 1,000 gallon vat in the foreground is used for cream and half and half. The 500 gallon vat is used for other specialty products.

utilize refrigeration. These machines are refrigerated in a mid-section area by means of a direct expansion ammonia coil. Flat paper cartons are fed into the machine, erected and waxed and then chilled for filling. It is the chilling operation that requires the refrigeration. Air is circulated over the direct expansion coils and then over the cartons to remove the heat put into them by the erecting waxing operation.

Utility refrigeration is again employed in the storage of the finished products. From the filling operations all products move by motorized conveyors to the 64 ft. x 172 ft. cold storage room (see Fig. 7). Inside the cold room (Fig. 8) the merchandise is systematically stacked to await delivery. Orders for wholesale deliveries and for route vans are made up in the cold storage room and placed on a conveyor for delivery to truck spots at the opposite ends of the room from their original entry. Motorized conveyors again move the product along through stainless steel vertical sliding conveyor doors.

Delivery of the product at the wholesale level is by means of insulated trucks equipped with blower units and mechanical condensing units. The units themselves may be either operated by their own internal combustion drives, the whole unit being mounted on the truck, or by electric driven units each arranged for plugging into electric outlets at the plant. Truck condensing units are fluorinated hydrocarbon refrigerant types. Route vans are insulated but do not employ any truck refrigeration. However, products are iced in the cases before being placed in the delivery vehicle.

Direct Expansion System

Although described as a direct expansion system NH_3 is not delivered to the ice builders, storage coolers, laboratory cooler or "Pure-Pak" in the same manner as the simple compression system. A Watkins Recirculator is placed in the system (see Fig. 9). Evaporator units are equipped with liquid solenoids and hand set liquid feed valves. NH_3 is forced through the system at condensing pressures, but the liquid and gas mixture is carried over into the suction system as far as the suction trap.

In the 36 in. by 8 ft. suction trap, gas is removed to the compressor, but liquid is taken off by the Recirculator and "pumped" back into the high side of the system between the high pressure receiver and the evaporators. Therefore, excess liquid not "boiled-off" in evaporators is returned to the evaporators again and again by the Recirculator. Evaporator surfaces are always fully wetted and compressors operate only on portion of refrigerant which has "boiled-off" in effective work.

The Recirculator is employed also as a compressor protective feature. By draining the liquid off and returning it to be used over and over again in the evaporator, the compressors are assured of a dry suction. The Recirculator system employs built-in safety features such as an

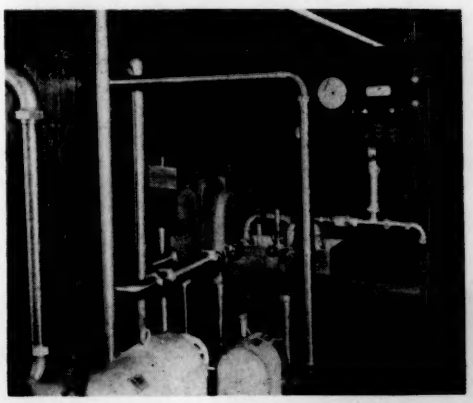


Fig. 4 — (left) One of Luick's three HTST Pasteurizing units. Cooling section of the Pasteurizer utilizes ice water. Panel board and recording instruments in the background control and record the operation of the Pasteurizer.

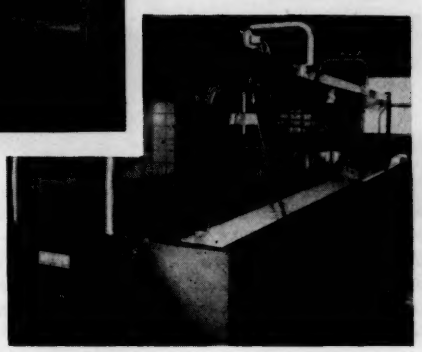


Fig. 5 — (right) One of five Sealtest cottage cheese vats. This one has a capacity of 18,000 pounds. Chilled sweet water is again utilized as the process refrigerant.

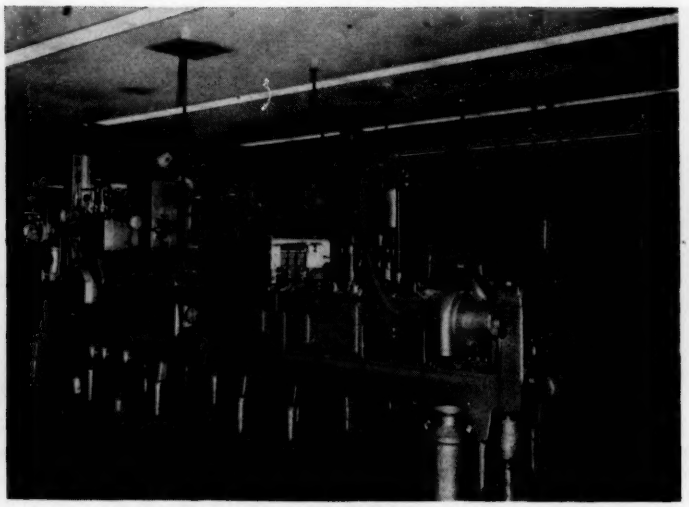


Fig. 6 — "Pure-Pak" carton assembling and filling machines use direct expansion ammonia. Cartons are received flat, assembled and waxed for filling. After the carton is assembled it is passed through a chamber in the center of the machinery and cooled by air circulated over a direct expansion coil.

audio-visual alarm which is set off by a thermostatic switch should the liquid reach a predetermined level that would not be considered safe. This would only happen in the event of Recirculator failure. As long as minimum requirements of discharge gas are available, the only probable failure of the Recirculator would be due to solenoid malfunctions.

A second built-in safety feature is a cut-out provision also actuated by a thermostatic switch. Should the liquid level in the suction trap go beyond the point where the audio-visual alarm is set off, the second safety feature would cut-out all motive power in the refrigeration system, requiring investigation and re-starting of the equipment by the engineer.

Storage, laboratory and Pure-Pak direct expansion demands roughly approximate 65 tons. The ice builder tanks require approximately 75 tons, giving a total demand of approximately 140 tons on the direct expansion system during operational peaks.

Niagara Units

Large milk storage room from which route vans are serviced is refrigerated by six Niagara 10-ton 12,300 cfm cooler units. Room temperature is controlled by thermostat to open or close main liquid solenoid and combined back pressure regulator and solenoid suction stop. Liquid ammonia is supplied to these units by the Recirculator. Defrosting is by natural air defrost. Only one unit of the six is on the defrost cycle at any one time, each controlled by a Paragon time clock. Air distribution is through duct work from each of the six units and air delivery over the product is by means of Anemostats. Each unit has its own individual solenoid and individual evaporator suction stop valve. Hook-up is shown in Fig. 10.

Twin Ice Builder

Chilled sweet water for milk, cheese and by-product processing is supplied by twin 75,000 lb. ice builders. Although appearing as a single structure (See Cover) in the basement of the plant, there are actually two tanks located on two sides of a line of building columns. The two tanks may be operated singly or as a unit. Motor driven agitators are provided in each tank and three pumps take suction from the tank manifold and deliver it through a common ice water distributing main. Inter-tank connections (24 in x 24 in) at the top and a common 10-in. suction manifold provide equalizing media in event one tank fills faster than the other, or in the event of accidental isolation by either inlet or outlet valve closure.

Over 16,000 lineal feet of 1¼ in. hot dipped galvanized pipe forms the coils in these two tanks upon which the ice accumulates. Control of the ice build-up is by means of a White-Rodgers ice-bank control. As the ice accumulates in thickness,

Fig. 7 — Double conveyor line from filling and crating floor enters milk storage through two vertical sliding doors. All walk-in and reach-in doors for both milk storage and laboratory sample cooler are stainless steel clad Jamison cold storage doors. Thermostat on the wall regulates the air temperature in the process room area which is refrigerated by well water.

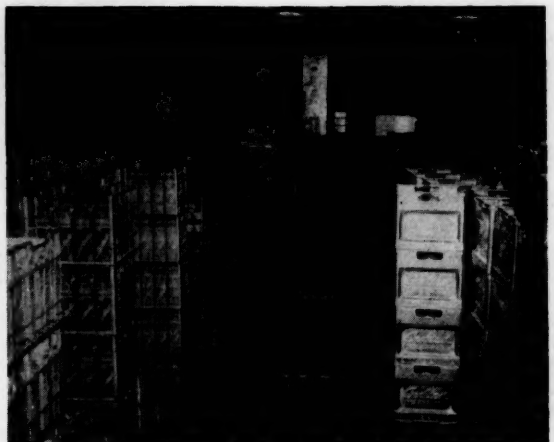
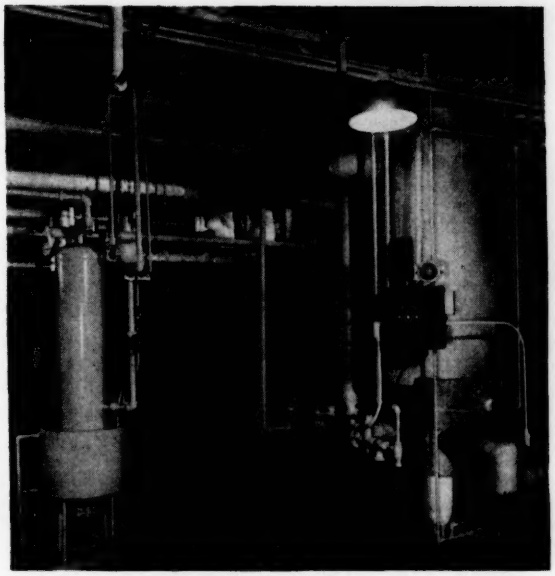


Fig. 8 (above) — Milk storage room workers assemble an order which is conveyed out to the loading platform and to a wholesale truck or route van.



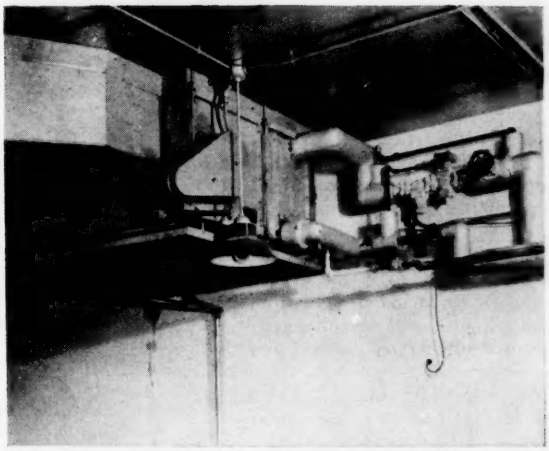


Fig. 10 — Typical of six cooler units installed in the milk storage room is this Niagara unit. Rated at 10 tons, each unit delivers 12,300 cfm refrigerated air. NH_3 is admitted by solenoid and hand set flow valve. Liquid pressure pilot operates Hubbell suction stop.

Fig. 9 — Two important devices to efficient evaporative surfaces: The combination suction trap and internal liquid recirculator (right), and an NH_3 regenerator (left). Frosted strainer and suction stop valve visible in the piping (center) are part of the ice builder controls. The patented Watkins Recirculator automatically removes liquid carry-over from the trap and by means of compressor discharge gas pressure and valve arrangement, recirculates the liquid through the evaporators. Oil drains from all evaporators to the regenerator. At suction pressure, heat from the compressor water jacket boils NH_3 off the oil which is wasted. Suction stop valve is pilot operated by the liquid solenoid, which is opened or closed by thermo-bulb control.

the heat transfer is reduced and the sensing bulb shuts off the liquid supply and suction outlet to the coils.

Process demands on the chill sweet water system melts off more ice during operating peaks than the compressor can restore. In the non-peak hours the ice builds up. This may take from 8 to 14 hours depending on the previous day's uses. In emergency, the ice builders can handle the entire milk production without the compressors, and one builder alone with a portion of the compressor plant can achieve the same results. The pipe is arranged in 16 banks of coils, each bank with liquid ammonia throttling valves and shut off valves. The banks of coils are overfed and the Recirculator returns its surplus ammonia liquid to coils. Liquid and suction valves are similar to those employed on the storage room line, and are by Hubbell.

The ice water pumps are three 700 gpm with a cut-off head of 110 feet against a normal 80-foot head operation. One pump practically runs continuously. At 30 pounds the second pump will cut-in to help the first supply whatever process demand is placed upon the system. The third pump is standby, cutting in at a few pounds lower than the second in the event of failure with one or the other pumps. Mercoid pressure

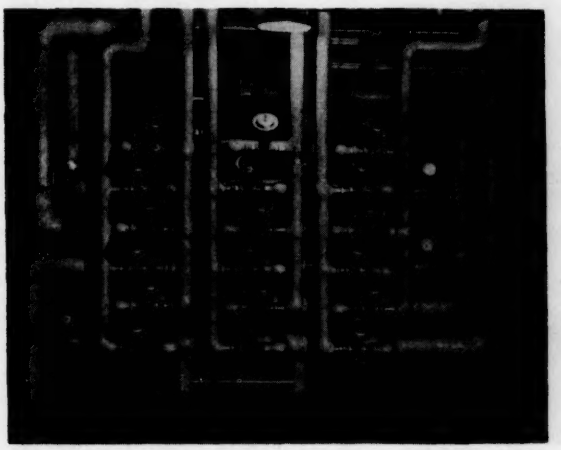


Fig. 11 — Process water control manifold. Well, chilled sweet, and hot water supply, and hot and chilled water returns are modulated by Johnson Service Co. pneumatically controlled valves to supply process needs.

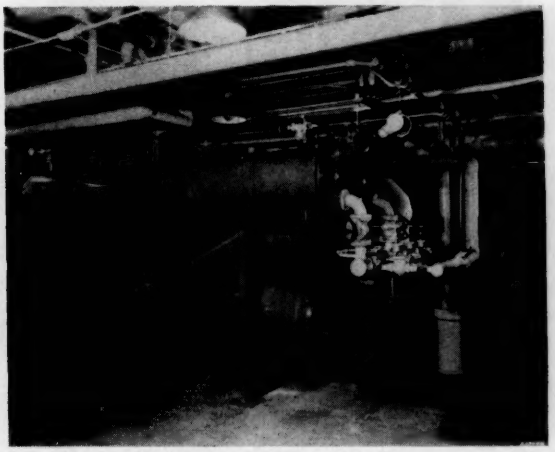


Fig. 12 — Condensing plant uses well water. At 54 F, well water is supplied to process area air cooling coils, then to the condensers. Liquid receiver is located directly below the twin condensers.

switches are employed to start and stop the pumps.

Water Control Station

Various processes within the dairy plant require different temperatures of water. A control manifold is arranged in the engine room for supplying these needs. Johnson Service Company automatic pneumatic temperature controls regulate modulating valves to supply the exact water temperature demanded by the individual process operations. Well water, refrigerated water and hot water are all supplied to the manifold pictured in Fig. 11. Valving is so arranged as to mix hot and cold water in proportions to give the proper temperature demanded at any particular processing unit.

Condensing Plant

Two 8-pass Vilter condensers 24 in. × 16 ft. (pictured in Fig. 12) serve the dairy ammonia plant. Condensing water is generally supplied from the company's wells at 54 F, but may also be serviced from the city mains. In operation, well water utilized in the process air conditioning coils is piped to the condensers, where this media which had picked up some heat in air conditioning coils is further utilized for condensing. If additional water is required for condensing, it is made up or added by the use of three 2-inch Refrigerating Specialties Co., valves, each provided with a solenoid pilot valve electrically interconnected with its respective compressor. From the condensers, water is wasted to the sewer at about 95 F.

City water can be used in both the air conditioning system and the condensers, or in either separately in event of any well water or mechanical failures. A 42-inch by 16 ft. Vilter receiver is mounted below the two condensers. An Armstrong purger is provided for venting noncondensibles from the system. Oil drains are arranged so that mixture of oil and ammonia from all evaporators will drain to an ammonia regenerator. This generator pictured in Fig. 9 uses compressor jacket water to apply an average 95F to an open jacket. Water is then wasted to the sewer. The regenerator operates at suction pressure. Oil collected there is removed to a contaminated waste. The oil drain lines may also be used for pump-out purposes.

TABLE II — THREE CONTROLLERS SET TO START, REGULATE CAPACITY & STOP COMPRESSORS IN THE LUICK DAIRY CO. PLANT HAVE SUCTION PRESSURE SETTINGS AS FOLLOWS:

Compressors	Suction Pressures (PSIG) Start	50% Capacity	Stop
No. 1	27	24	21
No. 2	29	26	23
No. 3	31	28	25

Compressor Plant

The compressor plant consists of three Vilter 900 rpm VMC's (See Fig. 13). One 8-cylinder machine was transferred to the new plant from the old location. It is operated by 100 hp 1800 rpm Allis-Chalmers 2300 volt induction motor. A new 8-cylinder compressor takes its place alongside the old. It is a 100 hp machine driven at 900 rpm with an Ideal Electric Company 2300 volt polyphase induction motor. Completing the battery of compressors is a new 6-cylinder VMC machine, also driven by 100 hp, 2300 volt Ideal motor, but at 1200 rpm.

The compressors are automatically controlled from suction pressure. The maximum refrigerating load requires two machines, and in operation, whichever compressor is selected by the controller setting as the lead unit will cut-in at 27 psig back pressure. The second machine will cut-in at 29 psig and the third (standby) machine at 31 psig (See Table II). As the machines pump down they are arranged to go to half capacity at 24, 26 and 28 pounds respectively for machines in lead, second and standby operating sequences. The machine operating at lead position will take itself off the line at 21 psig suction; second and standby units will come off the line at 23 and 25 pounds respectively.

All machines are equipped with an oil separator just ahead of the main discharge header. The oil collected is automatically returned to the compressor crankcase. Also temperature and pressure gauges are located in the suction and discharge lines at each machine, and, in addition, a compound gauge is located on the compressor side of each discharge stop valve. Check valves are arranged between the oil separators and the main discharge header.

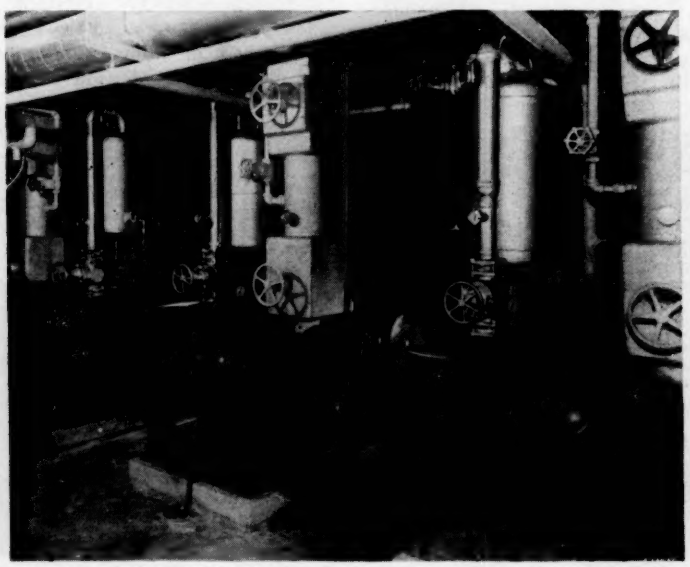


Fig. 13 — Compressor battery. Two 8-cylinder and one 6-cylinder Vilter compressors provide 225-ton capacity, ample for future milk process expansion plans. Separators for each compressor automatically drain oil to respective crankcases.

Compressor Control Board

Selector switches at the compressor location can be used to manually control the three VMC machines at the operator's option. A simplified stop station with lock-outs provides the means for emergency stopping of machines. The lock-outs are of such a nature that they will hold the stop button in the stop position and may be tagged out in such a manner that the tag must be removed to start the machine up. Adjacent to this stop station is an indicator unit and selector switch for each compressor. The selector provides for manual or

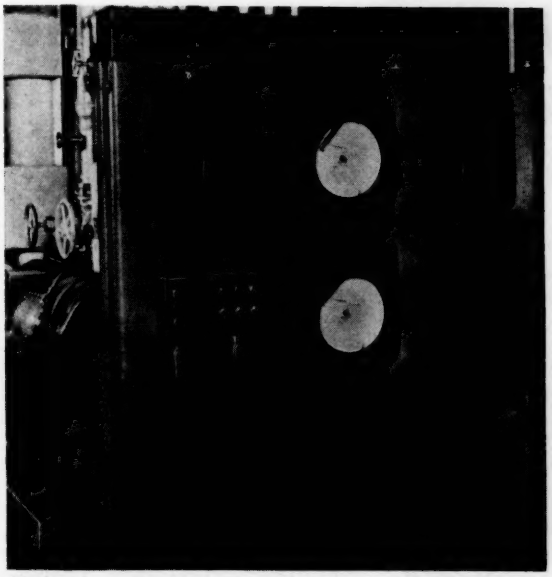


Fig. 14 — Compressor control panel. Suction pressure controllers across top of panel start, stop and regulate capacity of the three compressors in a sequence operation. Indicating controllers at left and right operate compressors No.'s 1 and 3, while recording type in center operates No. 2. Recorder in lower center charts inlet and outlet temperatures of the ice builders. Push button station provides emergency stop and lockout for each compressor motor. Other station contains selector switches and indicators for each compressor. Operator can place each unit on automatic, stop, or manual control at his option.

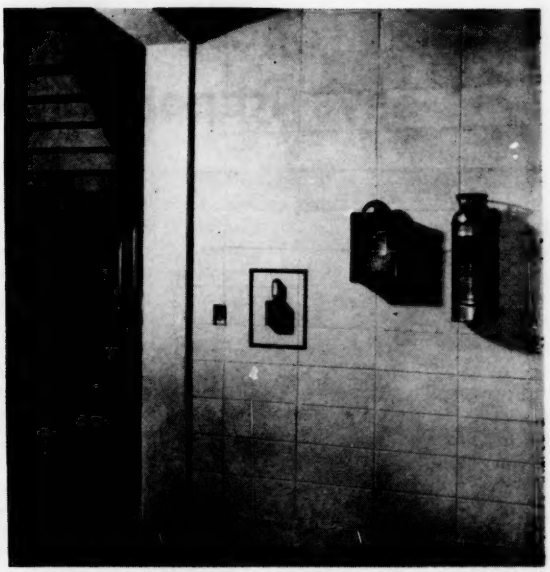


Fig. 15 (above) — Three entrances to machinery room are equipped with standard fire alarm pulls, gas masks and extinguisher. An added safety feature is provided in the fire pull. It is wired to stop all motive machinery in the basement and start vent fans when pulled.

automatic operation of the motor starters. (See Fig. 14).

Mounted on the same board are two Foxboro recording and two indicating instruments. One recording instrument operates on the main suction and charts the pressures over 24 hours. The manually set pointer on this controller starts and stops the No. 2 compressor. The two indicating instruments are hooked up with the compressors in No. 1 and No. 3, showing the operator at a glance the performance of each machine. A colored needle is set on each to show where the machine should come into operation in the automatic operating scheme. The other recording instrument records water temperature to and from the ice builder.

Recording and Indicating Units Sensitive

The recording and indicating units on this board are so sensitive that they are protected by high and low pressure cut-outs of their own. Solenoids are arranged in the gauge lines for this purpose. Zero to 40 psig is the range of operation. A suction pressure lower than zero or higher than 40 would isolate the instrument and sound an alarm.

Emergency Stations

Three entrances and/or exits as shown in Fig. 15 are provided to the engine room plant located in the basement. At each entrance just outside the engine room door is a fire alarm switch, a gas mask and fire extinguisher. The fire alarm in addition to the conventional wiring service, is arranged to shut off all motive power in the engine room and starts a basement ventilating set. Should an emergency occur, an engineer or other personnel detecting same can sound the fire alarm from outside the engine room stopping all machinery and preventing damage to the plant or equipment.

Electrical Power Panels

All electrical power panels are located outside of the engine room in one of three control centers. Electric switchgear is thus removed from moist atmospheres which would tend to endanger personnel and shorten equipment life. Control switches located in the dairy proper are of the non-arcing type and protected against moisture. Motor control centers are located in the basement (vault-station) for main process and refrigerating equipment; on the first floor for receiving pumps and conveyors; and on the 2nd floor for air conditioners, refrigerated storage room units and conveyors.

The basement electric control center contains two Sorgel air-cooled transformers; one 2300 volt 600 Kva for the 240 volt power bus, and the 2300 volt 225 Kva for the 120 volt power and lighting services. The 2300 volt service to this control center is from Luick's own substation transformers in the ice cream plant. The 2300 volt main board is a Roller-Smith switchgear production. All other 240 volt equipment is by Square "D" Co.

Designers

Designers of the 225-ton Luick Dairy Co. milk plant are Johnson & Johnson, Chicago engineers and architects, specialists in food process and heat transfer engineering. Refrigeration contractor was Burge Ice Machine Co., Chicago. Burge is another contracting and engineering firm experienced in such food processing industries as dairies, ice cream manufacturing, food freezing as well as cold storages and ice skating rinks. General supervision was by National Dairies production, management and engineering departments.

Frozen Foods Rate High in Nutritional Value Says Report on Extensive Research

THE FIRST authoritative analysis of the nutritional value of frozen foods, establishing the vitamin and mineral content of 30 frozen vegetables, 14 frozen fruits and seven frozen juices, was released at the National All-Industry Frozen Food Convention by Dr. L. J. Teply, director of projects at the Wisconsin Alumni Research Foundation. Results of this extensive research project launched in 1953 involved 16,716 individual tests of 27,562 samples.

Dr. Teply's report evaluated the 51 different food items for the occurrence of eight vitamins, six minerals and seven proximate components, such as calories, fats and proteins. The $25,000 project was undertaken as a public service by the National Asociation of Frozen Food Packers and received the financial support of 69 companies allied with the industry.

Frozen Food Nutritions

Described as one of the most significant contributions ever made to the food industry by a panel of eminent nutritionists, the research findings were said to establish that "the American housewife cannot buy more nutritious food than quick-frozen food."

"These findings confirm the opinion of many doctors and dietitians who have prescribed frozen foods for their consistent quality, flavor and nutritional content," said George L. Mentley, packers association president and marketing manager, Birds Eye Division, General Foods Corp.

Nutritionists who appraised the report at the opening session of the convention included Dr. Fredrick J. Stare, Jr., Chairman of the Department of Nutrition at the Harvard University School of Public Health; Dr. Hazel K. Stiebeling, Director of Economics Research, U. S. Department of Agriculture, and Dr. Elizabeth Niege Todhunter, Dean of the School of Home Economics at the University of Alabama.

High in Vitamins and Minerals

The nutrition research project's findings disclosed that among the highest in vitamins and minerals of the foods analyzed were asparagus, broccoli, collard greens, orange juice, peas, spinach and strawberries. Rated "excellent" as sources of vitamin C were broccoli, collard greens, grapefruit juice, orange juice and strawberries; of vitamin A collard greens, mixed vegetables, and spinach.

Rated "good" as sources of iron were lima beans, mixed vegetables, peas, black-eye peas, french-fried potatoes and spinach; as sources of protein, asparagus, broccoli, lima beans, collard greens, corn, mixed vegetables, peas, black-eye peas, french-fried potatoes and spinach.

For the benefit of diet-conscious Americans, the Wisconsin nutritionist listed the following frozen foods as "low" in calories: asparagus, broccoli, green beans, collard greens and spinach. Those rated "low" in sodium included asparagus, green beans, corn, grapefruit juice, orange juice, peaches, french-fried potatoes, red raspberries and strawberries.

Edwin T. Gibson, New York, president of the Eisenhower Exchange Fellowships, Inc., and former vice president of General Foods Corp., hailed the findings as proof that "the American homemaker cannot buy more nutritious food than quick-frozen food." In a major address to the full convention following the presentation of the research findings, Gibson called on the delegates to inform the consuming public of the scientifically - established high nutritional value of frozen foods.

"Other methods of food preservation always cost something in flavor, texture, color or nutrition," Gibson said, "but the ultimate method has finally been reached in freezing."

First Report on Frozen Foods

Although similar evaluations have been made on fresh foods at the time of harvest and of canned foods. a complete scientific analysis of the nutritional content of frozen foods conducted by an impartial research organization of recognized stature had never been conducted. As a result, the packers association launched the five-year research program in October, 1952, and awarded the contract to the Wisconsin Alumni Research Foundation, widely respected in the field of nutrition.

The method of sampling was formulated after consultations with Dr. R. J. Jessen, a statistician of international standing and a staff member of the Statistical Laboratory at Iowa State College. Nationally-recognized nutrition scientists were consulted in completing the research plans.

The mechanics of the research program, designed to obtain a complete, impartial and definitive study, called for the selection of the 51 different frozen food products to be evaluated for the occurrence of the following: vitamins C, Beta-Carotene, Niacin, Riboflavin, Thiamine, Folic Acid, Pantothenic Acid and B6; minerals — calcium, iron, phophorous, sodium, magnesium and potassium, and proximate components such as proteins, fats, carbohydrates, calories, total solids, ash and crude fiber.

The statistical sampling plan called for all variations of product resulting from weather, varieties, harvesting, processing, packaging and grades. Retail packages were taken from regular commercial production in 150 different freezing plants throughout the United States and Hawaii. Average age of the samples at time of testing was 6.8 months.

Authorize Purchase of Poultry by Germany

THE U.S. Department of Agriculture has announced issuance to the Federal Republic of Germany of an authorization to finance the purchase of up to $1,200,000 worth of poultry from United States suppliers under Title I of Public Law 480.

Authorization No. 31-01 provides for the purchase of approximately 3,000,000 pounds of frozen or canned poultry produced in the continental United States. Sales contracts between suppliers and importers made beginning March 2, 1956 and ending May 31, 1956, will be eligible for financing. Delivery will be to importers f.o.b. or f.a.s. vessel United States ports on or after March 2, 1956, but not later than June 30, 1956. Prior approval of charter or liner bookings by the Department of Agriculture will not be required for shipments under this authorization.

New Quebec Storage

INTER-Provincial Freezers Limited of Quebec City will build a $1,100,000 cold storage plant, it was announced by the company. Construction will get under way in May.

Wisconsin Plant Puts Modern Refrigerated Storage Facility in Service

THE MOHAWK Refrigerating Co. of Wisconsin completed a new refrigerated warehouse at 11400 West Burleigh Street, Milwaukee, Wisconsin, December 1, 1955. It consists of a basement and two floors, each with net piling height of 12 feet; contains about one million cubic feet, 665,000 cubic feet in low temperature freezer space, the balance in dry storage. This building is the first unit of a potential 10-unit building located in the center of an 18-acre strip of land reserved for future expansion. This is the hub of a new food distribution center in the Milwaukee trading area.

The building is of modern construction, with the new tilt-wall method. It is cork insulated and refrigerated by ammonia, with fin type coils. The blast freezer is located inside one of the freezer rooms and is capable of pulling temperatures down as low as minus 40 F. The plant is equipped with all the latest style mechanical handling equipment and the engine room is fully automatic, employing two-stage and liquid recirculating systems.

Immediately to the West of the Mohawk plant is A & P's new, modern warehouse completed in 1955. Roundy's Inc., a Wisconsin chain organization, is located in a new warehouse completed in 1955, immediately to the East of the Mohawk plant. Both of these firms have leased break-up freezer facilities in the Mohawk Building. Immediately adjacent to Roundy's is a tract of land purchased by Kohl's, another local chain organization, which will erect its facilities within a year or two. About two miles to the North of the Mohawk plant is a new warehouse of the Krambo Division of Kroger Food Stores.

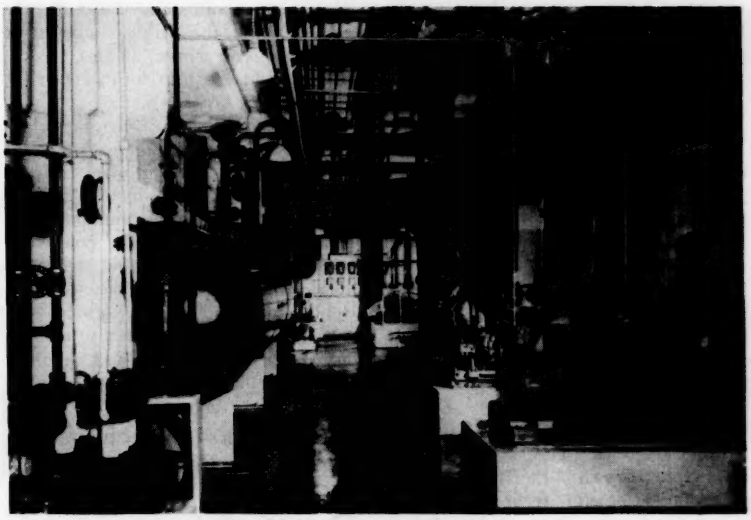


Fig. 1 — Looking down the engine room of the Mohawk Refrigerating plant from the engineer's desk.

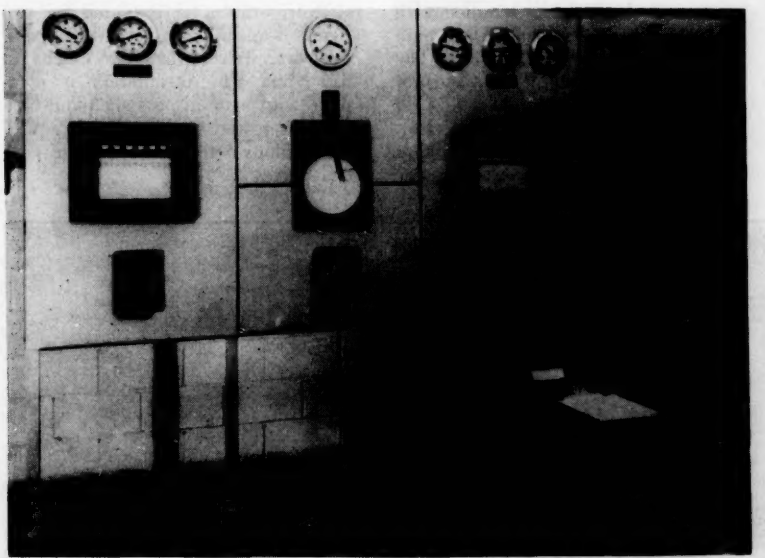


Fig. 2 — On this instrument panel of the Mohawk Refrigerating plant is recorded the performance of the various installations.

Mohawk is located just a quarter mile west of Milwaukee belt highway number 100 which completely circles Milwaukee County and connects with all major highways entering the County. It is expected that the new plant will become the central warehouse for all retail packaged frozen foods since trucking between such points as Milwaukee and Sheboygan, Green Bay, Marshfield, Stevens Point, Manitowoc, Madison, Fond du Lac, etc., will be shortened because there will not have to be any trucking into the heart of the Milwaukee downtown area where other warehouses are located.

Refrigerating equipment is pictured in Figs. 1 and 2. In the machinery view (Fig. 1), at left, is a 7½ hp 2-cylinder VSA Worthington compressor which is used for pump-out. Beyond the high pressure receiver, the horizontal vessel at the left, is another horizontal low pressure receiver with three ammonia pumps mounted beneath it. At the end of the room are the two condenser water pumps.

At the right are two Worthington multi-cylinder single acting high-stage machines. Closest to the engineer is the 6-cylinder 75 hp unit and directly behind it is a 4-cylinder 50 hp unit. In the background are two FES-Fuller rotary compressors used as boosters. One machine is driven by a 60 hp motor, while the second machine is motivated by a 50 hp

unit. An intercooler is placed between the booster compressor and the high pressure machines. Provision is made for an additional high stage and for another booster compressor on either side of the intercooler. All machinery and piping in the engine room is completely painted and color-coded.

Instrument Panel Shows Performance

Performance of refrigerating equipment is indicated by the instrument panel in Fig. 2. Observing the gauges, recording instruments and indicating lights in the panels from left to right and from top to bottom, the engineer would be informed of the following data: In the left panel, the NH_3 compound pressure/temperature gauges provide information on the intermediate cooler, the low pressure suction in the house and the low pressure suction at the boosters. The Minneapolis-Honeywell Brown "Electronik" 12-point potentiometer records temperatures in freezers and at low temperature points in the system. The time clock is mounted at the bottom of this panel.

In the next panel, beneath the clock is a 24/72 hour selector switch for use with a dial recorder beneath. The recorder charts in colored ink, the discharge from the booster and high stage machines. Compound gauges in the next panel indicate water pressure to the condensers, the NH_3 pump pressure and the high stage compressor discharge. The "Electronik" potentiometer recorder in this panel is a 20-station unit recording temperatures at various engine room points in the ammonia system and the high temperature stations in the house. It also records the humidity at four locations in the refrigerated areas.

The panel at the extreme right contains an ammeter for each booster and high stage compressor. Beneath the ammeters are indicators for the compressors, receivers, ammonia and condensing water pumps, condenser fans, water and ammonia solenoids and oil pressure systems. Colored lights indicate to the engineer the exact function being performed at any given moment by each item of machinery or portion of the plant.

Supermarket Warehouse To Include Refrigeration

A MODERN warehouse, costing $1,250,000 has been announced by the Pick-N-Pay Supermarket, Cleveland, Ohio. The building will occupy 200,000 square feet and will include about 30,000 square feet of refrigerated storeroom. The cold storage section will have special compartments for groceries, bananas, fresh produce, frozen food, butter and margarine.

Fruit Firm Leases Cold Storage Warehouse

ONE of the biggest fruit organizations in Wenatchee, Wash., The J. M. Wade Fruit Co. has leased its Wenatchee warehouse and cold storage facilities to a group of Chelan and Okanogan County growers. Announcement of the transaction was made by J. M. Wade and the officials of the newly-formed Wenatchee-Chelan-Oroville Fruits, Inc. Wade said his organization will continue operation of its 650-acre Johnny Appleseed orchard at Malott. Clois T. George, a longtime fruit industry man and recently manager of the Oroville Independent Growers, will be secretary-manager of the new firm.

George explained the organization will be an independent group, furnishing warehousing, packing and loading facilities for growers. Fruit brought into the house will retain its identity. The new firm will start in operation handling this season's cherry crop.

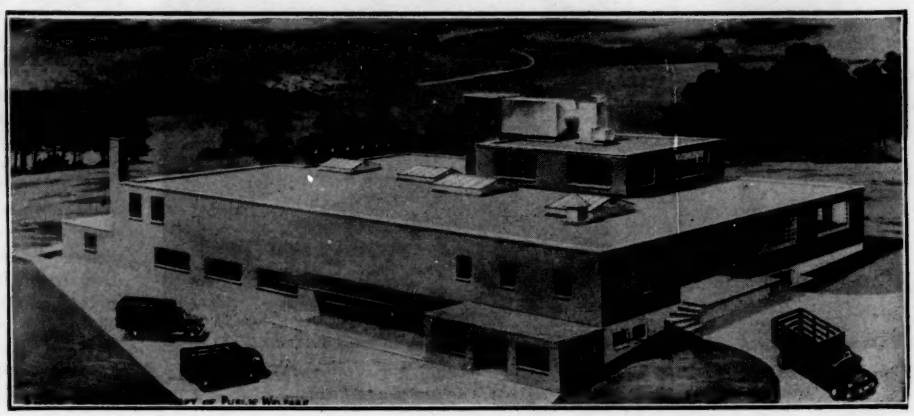
The present well-equipped plant evolved from the old Wenatchee Produce Co., founded by Conrad Rose. That firm shipped the first carload of apples from Wenatchee. Wade said it has, in its lifetime, shipped more fruit than any other house in the region. Cold storage capacity totals 310,000 boxes.

New Slaughter and Processing Plant for Georgia Hospital

A MODERN slaughter and processing plant has been built for the Milledgeville, Ga., state hospital at a cost of one third of a million dollars. This hospital is among the largest mental institutions in the country, with patients and staff members numbering more than 12,000 people.

The plant is arranged to operate on two levels, and is equipped with the most modern machinery. Hogs, cattle and chickens are handled with efficiency and dispatch. The main floor measures 90 by 150 feet. The chill room will handle 48 sides of beef and the aging room holds 80 carcasses. Six smokehouses are provided at one end of the processing room, together with a sausage cooler and three refrigerated rooms 12 by 30 feet, for pork.

Refrigeration is provided by two Frick 5-in. by 5-in. ammonia compressors, driven through V-belts at 327 rpm. The installation is complete with a multi-pass shell-and-tube condenser, and other high-side equipment, along with seven electric control valves.

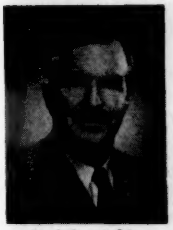


View of new packing house of the state mental hospital at Milledgeville, Georgia, which houses 12,000 patients and staff. Arranged to operate on two levels, this plant is equipped with modern refrigerating and other machinery. Frick refrigerating equipment.

Technical Papers and Conferences Highlight 52nd Annual Meeting of ASRE

A DIVERSIFIED technical program featuring some of the nation's foremost refrigerating and air conditioning engineers highlighted the 52nd Annual Meeting of The American Society of Refrigerating Engineers held in Cincinnati, Ohio, June 4 to 6, 1956 at the Sheraton-Gibson Hotel.

Three technical sessions were held at which nine papers were presented. Held parallel to the technical sessions were three conferences on domestic refrigerator engineering, air conditioners, and frozen foods. In addition, open forum discussions were held on industry cooperative research, and one sponsored by the General Technical Committee.



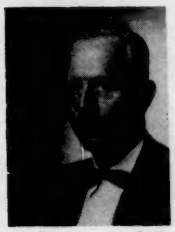
Carlyle Ashley

Hermann Spoehrer

Cecil Boling

Daniel D. Wile

Everett Palmatier



John Engalitchiff

Robert G. Werden

Charles Hamilton

Hermetic Motor Design Factors

Because of unique application requirement, motors, for hermetic compressors have variations from conventional motor design, according to Robert F. Munier, consulting engineer for The Emerson Electric Mfg. Co., St. Louis, Mo. Basic relationships among voltage, current and magnetic flux determine the proportions of the various sections of the magnetic structure and of the slot areas of laminations for motors, he stated.

"The most significant of these requirements in their effects on motor design are the need for carrying sustained high overloads, the necessity of a low temperature rise rate under locked rotor conditions, the necessity of using more and thicker insulation pieces in the stator slots, the importance of high rotor inertia in some compressor designs, the requirements for a large diameter rotor counterbore and the need for large vent hold area through the rotor."

"The counterbore and vent hole requirements have a much more pronounced influence in the design of two pole motors, in which the outside diameter of the rotor is inherently smaller. All of these factors much be considered and properly weighted in determining the best lamination details for the range of output which is built in each frame."

Galvanic Corrosion Minimized

Galvanic corrosion effect can be minimized in the use of dissimilar metals in refrigeration and air conditioning equipment, by selecting proper methods and materials. This opinion was expressed by J. F. Mason, Jr. corrosion engineer for the International Nickel Co., Inc., New York, N.Y. Mason pointed out the essential principles underlying the problem and the practical methods that have been adopted to prevent such corrosion. The most effective way for avoiding galvanic corrosion is to select materials which, when coupled, show no strong tendency to produce galvanic corrosion, he stated.

New Instrument For Moisture Analysis

A new instrument for the moisture analysis of 'Freon' fluorinated hydrocarbons was described by E. S. Taylor, Service Engineer, Engineering Service Division — E. I. du Pont de Nemours & Co., Inc. Taylor said that this novel and inexpensive portable electrolytic water analyzer is as precise and accurate as any other method for moisture analysis of 'Freon-12'. It operates continuously and automatically either in the plant on the process stream or on discrete samples, he said.

"Moisture in flowing vaporized samples is absorbed by an appropriate medium and electrolyzed forming oxygen and hydrogen. At a fixed sample flow rate, the measured electrolysis current is rigorously related to Faraday's Law to the absolute water content of the sample." Taylor also described the operational experience gained in the laboratory and in the plant.

Temperature Distribution in Cross-Flow Cooling Tower

An analytical method for calculating the water temperature distribution in a cross-flow cooling tower was described by S. M. Zivi, head of the engineering analysis section of the Midwest Research Institute, Kansas City, Mo. Bruce B. Brand, chief engineer, Havens Cooling Towers, Div. of Havens Structural Steel Co., Kansas City, Mo. was co-author of the paper. Zivi said that the method utilizes enthalpy difference as the driving force, similar to analyses for counter-flow cooling towers; however, the cross-flow arrangement introduces considerably greater complications than the counter-flow case. The computation is handled by representing the fill as a grid, and deriving mathematical relationships between conditions (temperatures and enthalpies) at adjacent points in the grid. The theory and results from computations for several typical temperatures conditions were included.

Deionized Water

Deionization of water for ice manufacture is not a "cure-all" of universal application but within its range of application it has significant advantages. These advantages can be realized only when intelligent care and supervision are given to the operation of the equipment so that wastage of regenerants can be held to a minimum. These statements

were made by W. C. Mills, chemical engineer, Olin Mathieson Chemical Co., Brandenburg, Ky. W. A. Cunningham, Professor of Chemical Engineering, University of Texas, Austin Texas was co-author of the paper.

"The key to the maintenance of low costs of deionization is efficient regeneration which apparently can be best obtained by using about 80 percent of the regenerant required for theoretical complete regeneration and by re-use of the last part of the solution from each cycle. If raw water costs are high it is important to hold wash water usage to a minimum. This can be done by efficient regeneration, by allowing rinse water to "soak" on the resin beds for several hours and by recycling a portion of the rinse water. Quality ice can be made without core removal but with air agitation from water containing at least 100 parts per million total dissolved solids. Deionization to a lower figure is wasteful and should be avoided." He said that total treating costs for efficient deionization should be between four and six cents per 1,000 gal for each grain per gallon of dissolved solids removed.

New Food Process

A "new" process in which high gamma radiation is combined with refrigeration for increasing the storage life of cooked meats, blanched vegetables and other foods packaged in plastic bags was described by L. E. Brownell, supervisor, Fission Products Laboratory, University of Michigan, co-authored by S. N. Purohit, Graduate Student at the University of Michigan. The new process known as "High Radiopasteurization combines Gamma Radiation and refrigeration. Commercial development of the process he said probably would greatly increase use of refrigeration both in commercial handling of food and storage in the home.

Temperature Changes

An extension to the existing knowledge of the transient operating characteristics of refrigeration systems was presented by J. L. Threkeld, associate professor of mechanical engineering, University of Minnesota, in a paper co-authored by Tamami Kusuda, research engineer, Worthington Corp. The approach was made by discussing capacity characteristics of simple direct expansion systems, variation of capacity during pulldown period, and changes of wall and air temperature of a refrigerated room.

By a simple graphical analysis it is possible to show the relationship of condensing unit capacity, evaporator capacity, and saturation suction temperature with respect to room air temperature during pulldown. An extension of this analysis may be used to predict the minimum space temperature which may be produced by a given refrigeration system.

An important pulldown problem is the time required to reduce the temperature of a refrigerated space from ambient temperature to the design operating temperature. By incorporating a modified Schmidt plot for unsteady-state heat conduction with the graphical analysis mentioned above, it is possible to make a time analysis of air and wall temperature reduction during the pulldown period.

A Practical Heat Pump

A heat pump that will work efficiently at low temperatures without the need for supplementary heating was described by Robert G. Werden, industrial sales engineer, York Corp. The paper presented the relative heating capacities, power inputs, and coefficients of performance of both single stage and two stage air source heat pumps. The development of two-stage air source heat pumps places it in an entirely new perspective, Werden said. An article in the June INDUSTRIAL REFRIGERATION described the operation of this system.

Turbulent Flow of Air Through Capillary Tubes

A paper by F. G. Smith, Asst. Metallurgist (Retired) The American Brass Co. gave details for the development of a practical method whereby the inside diameter of capillary tubes can be quite accurately estimated from air flow capacity determined under standard conditions as per ASRE Standard 28-56.

An empirical formula for air-flow capacity in terms of inlet test pressure (psig), inside diameter of tube (inches), and length of tube (feet) is developed from the average of 4 tests on each of 694 combinations of pressure, inside diameter and length. Test pressures cover a range from 10 psi to 100 psi; inside diameters, from about .030 to .090 in.; and lengths, from 2 to 20 ft.

Frozen Food Conference

At the frozen food conference, a variety of subjects were discussed including: frozen bakery products, by Niles H. Walker, director of product control and development, Arnold Bakeries, Inc.; frozen seafoods, by Charles Butler, chief technology section, Fish & Wildlife Service, Department of Interior; frozen dairy and poultry products, by W. C. Loy, chief chemist and director of dairy and poultry research, Wilson & Co.; frozen citrus products, by Theodore H. Allegri, transportation and facilities branch, Marketing Research Division, U. S. Dept. of Agriculture; frozen fruits and vegetables, by K. G. Dykstra, director of laboratories, Bird's Eye Division, General Foods Corp.; frozen cooked foods, by Jacob Fisher, president Frigidinner, Inc.; frozen meats, by Clarence K. Wiesman, manager development department, Research division, Armour & Company; transporting by truck, by M. G. Green, vice-president, U. S. Thermo Control Co.; frozen food warehousing, by Vallee Appel, Fulton Market & Cold Storage Co., Chicago; transporting by rail, by Jno. C. Rill, president Fruit Growers Express Co.

Air Conditioning Conference

The air conditioning conference gave chief consideration to packaged commercial units. At this conference, discussions were presented by F. C. Wood, York Corp., on central plants for larger buildings; M. D. Irwin, Carrier Corp., on new field application problems of air-cooled condensing equipment; Justin Neuhoff, General Electric Co., on condensing surface and air quantities for integral horsepower air cooled air conditioning equipment; P. W. Wyckoff, Airtemp Div. Chrysler Corp., on compressor unit design considerations for air cooled condensing equipment.

Discussions at a forum sponsored by the General Technical Committee covered: corrosion problems of blower equipment; methods of rating and testing transportation refrigeration equipment; contaminants in refrigerating systems; central air conditioning vs room air conditioners for apartment houses; what value suction line heat exchangers; leak testing methods and equipment.

Industry Cooperative Research

An open meeting for engineering executives and other company representatives was held to determine whether or not industry is interested in having ASRE set up a technical task force to coordinate industry-wide efforts to solve given problems that have proved to be difficult or costly for any one company to solve alone.

(*Continued on page* 58)

Snow Ice Used in Concrete Construction

SOMETHING new has been added in heavy concrete construction. It is snow and it is used to strengthen concrete by preventing cracks, says an article in "Bechtel Briefs" for October, company magazine of the Bechtel Corp., Engineers-Constructors, San Francisco, Calif.

In structures of large dimensions the freshly-poured concrete heats during the curing period, especially in warm weather, and the heat causes expansion. Then, as the concrete cools, there is corresponding contraction. And contraction may cause cracks, particularly at joints. Both expansion and the subsequent contraction can be minimized by keeping the concrete mix at as low a temperature as possible at the time of placement.

These considerations assumed major importance in the design of the huge rigid frame reinforced concrete structure for the new Fluid Coking Plant at the Avon Refinery of the Tide Water Associated Oil Company, located on Suisun Bay near San Francisco. This new Coking Plant, the largest in the world, includes a reactor 200 feet tall and 30 feet in diameter, a burner 76 feet tall and 44 feet in diameter and considerable incidental equipment. The total weight supported by the main structure is about 15,000 tons.

How snow was made for construction job. Ice was pulverized on truck in the background, blown into piles on the construction site and then moved to the point of use.

Largest Support Structure

The support structure is believed to be the largest of its type built to date in any refinery. It is 106 feet long by 66 feet wide and 104 feet in height. It has 8 columns, each 8 feet wide by 6 feet thick and soaring 96 feet above the ground. Two rows of horizontal beams, each 7 feet by 5, bolster the columns. At the top there will be a concrete slab the full length and breadth of the structure and 8 feet thick. From it the coking vessels will be suspended, with about half their length below it and half above. The quantities of materials include 5000 cubic yards of concrete, 800 tons of the largest available circular reinforcing steel, 2⅜ inches in diameter, and 100 tons of smaller reinforcing steel.

A tight construction schedule required that the structure be built in the heat of the summer in an area where temperatures over 100 degrees Fahrenheit are normal. Under such conditions the cooling of conventional concrete would be difficult. Precooling of aggregate and water would be lost during transit mixing. Cooling in place would require internal pipe coils and elaborate refrigeration.

After consulting with Professor R. E. Davis of the University of California, a foremost authority on heavy concrete construction, Bechtel forces decided to use Prepakt construction. In this method the reinforcing steel is placed and the form built around it, with pipes installed for the final grouting operation. Then the forms are tightly packed with the same quantity of washed coarse gravel which would be used in conventional concrete mixing. Finally a thin grout—consisting of cement, fine sand, fly ash, water and "Fluidizer" additives—is pumped into the forms. As the grout level rises in the forms, the filling lines are withdrawn. The end result is a monolithic structure of high-strength concrete.

Snow Cools Aggregate

The Prepakt method is ideally suited to close control of internal expansion and subsequent contraction. The aggregate can be cooled in place by dumping snow (pulverized ice) on top of the gravel and forms and allowing it to melt and trickle down through the rock, chilling the entire mass. The mix water also is chilled with ice immediately before the mixing and pumping of the grout. The bridging effect of the tightly packed gravel also helps to prevent contraction during cooling and curing.

Cooling Method

The cooling method is simple. About 24 hours before a pour, large quantities of artificial snow are put into the forms. It melts and the water seeps down. Snow was used three times in the construction of the columns and beams—60 tons for the first pour, which was completed on July 29; another 60 tons for the second pour which was completed on August 24, and still another 60 tons for the third pour near the end of September.

Approximately 60 tons were to be used during the pouring of the slab, for which preparations were under way. This will bring the total to about 240 tons. The pulverized ice was supplied by the Union Ice Company.

Modern Ice Rink Attracts New York Skating Enthusiasts

Installing piping in Low-Tor Ice Rink. Left: Coupling lengths of Spang CW steel pipe for the grid of the Low-Tor Ice Rink, West Haverstraw, N. Y. Nine inches of bank-run gravel, topped by a layer of fine sand, forms the base of the rink. The 1-inch pipes are laid 3½ inches apart on T-irons, resting on 2 x 4 inch "sleepers". Another layer of sand covers the pipes in the completed rink. Center: Welding one of the header lines. In the background can be seen the grid of 1-inch pipe through which refrigerated brine is circulated. Right: Making final connections during the installation of Spang Steel Pipe in the Low-Tor Ice Rink. Workman at right is leaning over header, which carries refrigerated brine from the compressors to the 1-inch pipes that form the grid. Note the shut-off valves that make it possible to regulate the flow of brine to every part of the rink. Each 1-inch pipe crosses the width of the rink, makes a U-turn, and is connected with the return line at bottom.

AT THE foot of Low-Tor Mountain, in a resort area of New York's Rockland County, sports enthusiasts are finding a new attraction this winter. It is the Low-Tor Ice Rink, an 85- by 150-foot outdoor rink, operated from October 15 to April 15 each year. The location, in West Haverstraw, N. Y., is just 20 miles north of the George Washington Bridge.

Built for William F. Larkin, owner of the Garnerville Ice Company, the rink adjoins the ice company plant, and utilizes the same compressors. Mr. Larkin also supplies the artificial snow used for the ski-jumping meets at Bear Mountain. More than seven miles of Sprang CW steel pipe, manufactured by the Spang-Chalfant Division of The National Supply Company, forms the grid of the rink. The Jersey Ice Machine Company, which built the rink, used Spang 1-inch steel pipe for the grid, and steel pipe in larger sizes for headers and other lines.

The Piping

The headers, at the side of the rink, step down from 10-inch pipe to 4-inch pipe. The brine return is a 10-inch line, laid at the bottom of the system alongside the same side of the rink. The whole feed and return system is covered with wooden boxing, which also serves as a guard rail.

Twelve-inch pipe is used from the compressors to the headers, and 10-inch pipe from the pumps to the compressors. A system of shut-off valves leading from the header pipes makes it possible to regulate the ice temperature throughout the rink, avoiding spots where the ice is too hard or too soft.

Refrigerating Equipment

Refrigerating equipment includes three Frick ice compressors, generating approximately 100 horsepower, and capable of producing 35 tons of ice a day. Two 450-gallon pumps circulate 900 gallons of refrigerated brine a minute through the piping of the ice rink, at a pressure of 30 pounds per square inch. The system has been tested at better than 125 pounds per square inch. B. E. McFarland engineered the rink.

The rink was built by leveling off the ground and then laying 9 inches of bank-run gravel, topped by a layer of fine sand. On top of the sand are 2 x 4 "sleepers" with T-irons on 7-foot centers. The 1-inch pipes are laid 3½ inches apart. Each line forms a long loop that extends from the header to the opposite side of the rink, makes a U turn, and continues to the return line.

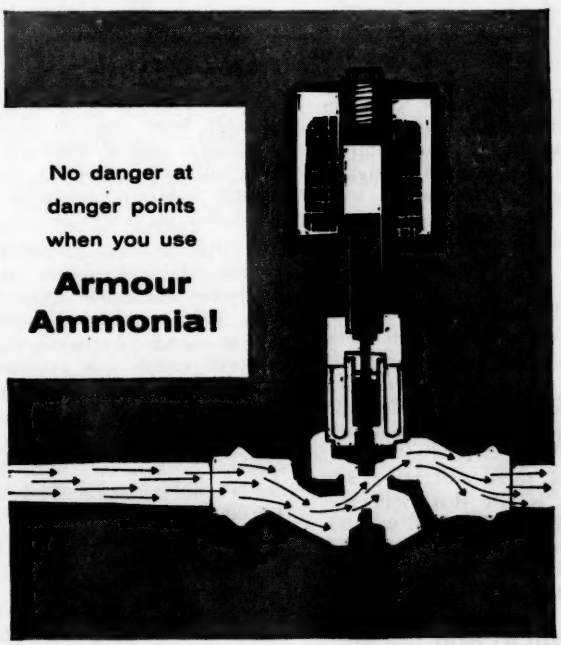
The pipe is covered with a layer of sand, over which water is sprayed. Circulation of refrigerated brine through the grid causes the water to freeze, forming a firm surface of ice. The brine is treated with sodium bichromate as a means of inhibiting corrosion.

William F. Larkin has been manufacturing artificial ice since 1928 in three different plants in Rockland County. He says that, in his experience, steel pipe of the type obtained from Spang is the best for ice-making systems, commenting that "it lasts longer and is better able to withstand corrosion." J. Willett Larkin and Richard Larkin are assisting their father in the management of the rink.

New Wisconsin Corporation

THE City Products Corporation, of Ohio, has registered with the Wisconsin secretary of state at Madison to do business in Wisconsin, "to manufacture and deal in ice, ice cream, refrigerators, dairy products, beverages of all kinds, machinery, oil, coal, gasoline, cement, building materials, etc. The application shows a capital stock of 3,000,000 shares of common of no par value, of which 2,271,827 shares are reported to have been paid in up to time of application. The registered agent in Wisconsin is C. T. Corporation System, 900 Gay Bldg., Madison, Wis., the main office of the corporation being located at Union Commerce Bldg., Cleveland, 14, Ohio.

A NAPRE* Vice-President found errors in this drawing—can you?



It's 99.98% pure, extremely dry and free of oil and non-condensable gases.

Frozen valves and other refrigeration system dangers such as corrosion, sludge and ice in evaporators can be caused by impure ammonia. They can result in the necessity of a system evacuation, permanent equipment damage—even plant shutdown! You can prevent these costly situations by insisting on pure, dry Armour Ammonia. And you can be sure of dependable service and supply, too. Armour maintains offices in 116 cities. Mail this coupon today for information on cylinder and tank truck delivery service.

Armour and Company, 1355 W. 31st Street, Chicago 9, Illinois
Send me further information on Armour High Purity Ammonia.

Name_____

Firm_____

Address_____

City_____ Zone____ State____

ARMOUR Ammonia Division

Jumping Jehoshaphat! You fellows (and particularly you NAPRE members) are certainly alert. We've been overwhelmed by comments and letters concerning the illustration in our recent advertisement. In fact, we shudder to think what would have happened if you had seen the *first* valve drawn by our artist. That one was *wholly* a product of his imagination.

Actually—our artist drew a "loose" sketch of a typical valve in a refrigeration system to illustrate danger points referred to in our copy. However, the drawing was not quite "loose" enough. We got too close to the real thing and thereby made our mistake.

We're sorry the drawing may have been disconcerting. But please accept our congratulations for being so observant. In future advertisements, we'll try to be as careful as we are with the quality of our ammonia. And you can't be more careful than that!

**National Association of Practical Refrigerating Engineers*

ARMOUR

Ammonia Division

Armour and Company • 1355 West 31st Street • Chicago 9, Illinois

High Velocity Systems A Modern Trend in Air Conditioning

IN TEXAS, where air conditioning is considered essential, architects and engineers are fortunate to have several differing systems available for their use, according to an article in The Texas Architect by Curtis H. Joshen of Bernard Johnson & Associates, Houston, Texas. Relative newcomers to this field are the single- and double-duct high-velocity air distribution systems.

When designing an air distribution system for a new building, architects may often find that high-velocity systems have a number of advantages when space is a major factor. This holds true because both the trunk and the feeder ducts run about half the size of those used in the normal low-velocity system.

When adapting a system to an existing building, the smaller ducts of the high-velocity systems are even more desirable because of the smaller holes required through existing floors and walls. Also it is easier to thread the ducts around beams and joists already in place.

Trend is Toward Individual Room Control

Studies have shown that the modern trend in air conditioning is more and more towards individual room control. The high velocity double duct system meets this demand, for it can provide for positive control in each room. It works like a water faucet in that you can mix various amounts of hot and cold air to give the desired temperature. Of course, in a single duct system only the amount of cold air or warm air can be regulated, depending on whether the system is on the cooling or heating cycle.

Flexibility to add or relocate units is an important feature, especially when the moving of office partitions might occur from time to time. The air balance is disturbed only slightly by these changes and the pressure can be rebalanced very easily. Besides providing for a more accurate balance than other systems, the balancing process normally takes much less time.

Today, acceptance by Texas architects and engineers of the principles of high velocity air distribution is on the increase. This is based primarily on the following key points:

Reasons for High Velocity

1. There are no fans, no filters, and no motors to be maintained except in the centrally-located equipment rooms. This is particularly welcomed by maintenance staffs for time consuming trips to individual rooms are unnecessary and they do not have to disturb occupants of the building while servicing the system.

2. Sheet metal workers can do all the duct and outlet installation. There is no dispute as to which trade handles what job because electricians, plumbers, and steam-fitters are needed only at the centralized machine room location of the motors and pumps.

3. High-velocity air-units require no water or coils, which collect lint and eventually have to be manually cleaned.

4. Another factor is the quiet operation in individual rooms due to the fact that the air flow controls and valves are scientifically designed to reduce the static pressure with a minimum of sound regeneration. Scientific design also eliminates drafts from improper diffusion of the air.

The double duct system provides chilled and warm air to each space simultaneously so the two can be mixed. The single duct system uses the same duct for hot or chilled air depending upon the outside temperature.

Because of these and other advantages, it is felt that both the single and double duct high velocity air-conditioning systems will be used more and more in the air conditioned cities of Texas.

Textile Plant to Add Air Conditioning

THE UPPER floor of the sheeting mill, textile plant of the Limestone Manufacturing Company, Gaffney, S. C., will be air conditioned, it was announced by T. G. Roche, vice-president and general manager. Exact amount of the contract was not revealed, but Mr. Roche said it would be "several hundred thousand dollars."

The new air conditioning system will provide an approximate temperature of 84 degrees and will maintain a 50 to 53 percent relative humidity throughout the plant's carding and spinning departments.

Frozen Food Locker Industry Looks Ahead

THE FROZEN food locker industry according to L. B. Mann, U.S. Dept. of Agriculture, Washington, has taken on new life after a slump that saw some 1,000 marginally operated plants fall by the wayside in the three years ended 1953. Mr. Mann was in San Francisco to address the Western Regional Convention of the California Refrigerated Lockers Association. Some 300 locker operators from throughout the country attended the three day meeting.

The USDA official said 1955 was one of the best the industry has had in the past four or five years and the outlook is for substantial improvement. Despite the 1,000 plant shakeout, the industry services 5,000,000 families which is 800,000 more than 1950. Other favorable trends in the industry:

Favorable Trends

1.—An increase of more than 4,000,000 home freezers since 1950 reaching a total of 8,100,000 by the end of 1955—which represents greatly enlarged potential market for locker plant service.

2.—An increase of 200,000,000 pounds of food custom processed for locker and home freezer patrons since 1950, reaching a total of 1.4 billion pounds. An additional 250,000,000 pounds was processed and sold through retail and wholesale outlets.

3.—Estimated net zero storage space in lockers and home freezers nearly doubled since 1950, totaling 120,000,000 cubic feet with a storage capacity of 3-2/3 billion pounds of frozen foods.

Mann said frozen food locker plants have changed the buying habits of a lot of people. They not only buy in quantity but are making purchases during periods of flush supplies, he pointed out.

The trend today is more and more toward financing large food orders, Berl Buis, president, National Frozen Food Locker Institute, Marion, Ind., observed. He estimated that approximately 16 percent of the locker plants throughout the country operated food plans in 1954.

What does the future hold for the locker business? Mann said it lies in the fields of processing and merchandising. Locker plants are particularly well suited to perform the type of "specialized service" needed by home freezer users, he added.

What's Ahead in Automation – General Survey of Industry Shows Progress

THE heating, ventilating, air conditioning and refrigeration industries appear to be highly interested in the possibility of automation but are not too hopeful of finding the types of equipment suitable to the industry's operations. This was revealed by the American Society of Tool Engineers following completion of a national study on automation. The industry believes for instance that about 40 percent of its production welding operations and 30 percent of its materials handling operations are automatable, but does not believe that any sizable proportion of this automation can be achieved by converting existing equipment.

While a certain amount of automation can be achieved it is believed by modifying present equipment, opinion as to whether such a procedure would pay for itself is divided about 50-50 in the industry. In contrast, about 90 percent of those replying indicated that the right kind of new automated equipment would pay for itself in increased production and lowered costs. Incidentally, the industry estimates that about 15 percent of its metal forming, grinding, finishing and inspection operations can eventually be automated, plus about 20 percent of its machining operations.

Indicating the industry's difficulty in locating the type of automated equipment most suitable to its needs is that only about 10 percent of new equipment purchases will specify automation in 1956. The total for the two years, 1956-57, is estimated at around a more hopeful 15 percent.

Materials Handling

Materials handling in industry at large, according to this survey, is due for major future automation, apparently. The potential seems to be about 25 percent of operations. The 250-1000 worker plants actually estimate an average of 30 percent for themselves. The smallest plants estimates are around the 15 percent level.

Largest plants average 25 percent. Two-thirds of the automated operations will be by purchases of new equipment. About 1/3 will be produced by modifying, apparently. The 1000-5000 plants put the ratio at 5 to 1 in favor of buying new equipment to do the job.

Effect on Design

While this study had not intended to do so, it did reveal that a more extensive use of automation would have vital and far-reaching effects on product design. Time and time again, returns from industrial plants indicated that the most important development in connection with the adoption of automation would be greater standardization of components in the company's own products. A high proportion of companies supplemented this by calling for more active selling by their own organization of their own standard products to increase production volume on standard components.

Third by a neck was strong evidence that many companies would tend to redesign their products with automation in mind, eliminating those variables between models as were difficult to assimilate in an automatic or semi-automatic production setup.

New Developments

Biggest single factor which could greatly accelerate the broader adoption of automation in industry appears to be development of standardized units which would not have to be scrapped every time there is a model change but could be reused with only minor modifications or adjustment for a number of years.

Added to this should be "greater versatility in the control and operating equipment to handle wider ranges of sizes or more complex operations than is now possible." The need for automation equipment, adaptable for short runs, is evident in the returns from the current study. When and if such equipment can be provided automation should take a major step forward, it is believed.

Among developments in the direction of versatility would be automatic individual programming of production operations, including wider usage of tape and punched-cards controls on manufacturing equipment. The working out of simplified machine control panels which would permit greater flexibility of control to allow for job lots is also indicated as desirable in the returns received.

Surprisingly, relative high cost of present automation equipment is not as frequently mentioned as an objection as might have been expected, though desire for lower cost equipment does appear on many of the returns as a factor which would "assist in expediting" the wider adoption of automation.

Considerable criticism is voiced regarding the quality of available automation equipment. "A good tool engineer never thinks anything is good enough," points out Harry E. Conrad, executive secretary of the ASTE. "As a matter of fact for example, tool engineers are still looking for something that is harder than a diamond and which is still tough enough so it can be used for machining."

Fact Finding Conference in Kansas City—1957

THE FACT Finding Conference sponsored by the Institute of American Poultry Industries will return to Kansas City, Missouri, in 1957 for the 12th consecutive year, Dr. Cliff D. Carpenter, Institute president has anounced. The 28th annual business session will be held Friday, Saturday and Sunday, February 15, 16 and 17, 1957.

Running concurrently with the adult conference will be the fourth Junior Fact Finding Conference for 4-H and FFA teen-agers sponsored jointly by the Institute, the Federal Extension Service and the National Committee on Boys and Girls Club Work, Inc.

A record attendance was reached at the 1956 Fact Finding Conference held February 10, 11, 12 as 2976 people registered, including over 100 Junior Fact Finders, leaders and chaperons from 24 states. One hundred twenty-seven companies exhibited products, services and equipment for the poultry and egg processing and marketing field in more than 50,000 square feet of exhibits the largest in the eleven years displays have been a part of the annual Conference.

New Seafood Freezing And Storage Plant

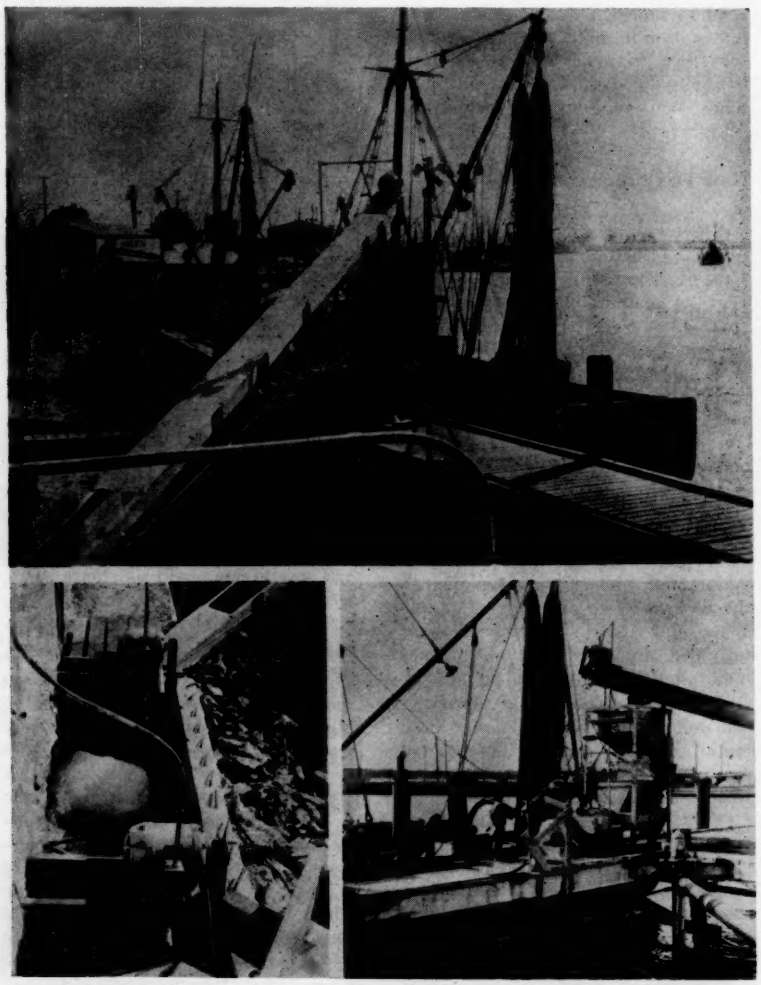
PLANS for formation of a new $300,000 corporation, the Neptunalia Seafood Co., have been announced by William Mullis of Savannah, Ga. Mullis said a plant would be built in Savannah, which ultimately will employ from 200 to 300 persons. In addition to the processing plant, freezers and cold storage facilities will be built.

Shrimp Boats are Coming – – For Ice

SHRIMP ON ice is the purpose of this modern screw-conveyor system at Port Aransas, Texas. With it, the Harbor Ice Company automatically loads tubular ice on Gulf shrimp boats at a peak rate of 60 tons per hour. Extending from left foreground in upper photo is one of two 45-foot conveyors which move ice from a storage vault on shore (lower left photo) to weighing hoppers on the dock. This and other screw conveyors in the installation are products of Fort Worth Steel & Machinery Company, Fort Worth. The conveyor system was designed by Brance-Krachy Company of Houston, distributor of Fort Worth products. It has been in continuous service since June, 1954, with only routine maintenance required to keep the system operating efficiently and economically. The system includes screw conveyors which move ice from ice-making machines to the storage vault.

Photos Show Operation

Lower left photo shows two feeder screws emerging from the vault and connecting with the conveyors which extend to the dock. In the center of the lower right photo is seen the flexible spout through which the ice moves from the weighing hopper to the hold of the fishing vessel. Basic component of the pictured conveyor is a 12-inch-diameter helix which rotates in the U-shape trough at a maximum speed of 90 rpm. Advantages listed for the screw-conveyor system for the ice-loading job are low initial cost, long life, low maintenance and high capacity.



Screw-Conveyor Installation in Harbor Ice Company Plant.

Biggest Frozen Food Pack Announced By Packers

THE frozen food industry's pack of frozen fruits and vegetables for 1955 totaled 1.8 billion pounds, an all-time record which was 20 percent higher than the total for 1954, it was announced by the National Association of Frozen Food Packers. The figure was contained in the annual year-end summaries of frozen fruit and vegetable production compiled by the Association from reports submitted by the industry.

Frozen Vegetables

The pack of frozen vegetables, which is the industry's largest single category, amounted to more than 1.1 billion pounds, 17 percent higher than the 1954 pack. The fruit pack, though smaller, showed an even higher percentage gain. The total for fruits was nearly 660 million pounds, up 26 percent over 1954.

Among the frozen vegetables, peas, as usual, led the way. The industry packed a total of 231 million pounds, a new record which was nearly 12 percent greater than the 1954 total. The second highest vegetable pack last year was potato products (principally french fried potatoes). This pack rose 51 percent higher than the year before and 82 percent higher than in 1953.

Two other frozen vegetable packs totaled over 100 million pounds for the year. The pack of green and wax beans, the third high category totaled 121 million pounds, a two percent decrease from 1954. The spinach pack, showing a 65 percent rise over 1954, went over the 100 million mark for the first time as it totaled a little more than 110 million pounds. The biggest percentage rise among the frozen vegetables was shown by cauliflower, which totaled 40 million pounds for 1955. This was 135 percent higher than the 17 million pound total in 1954.

Among the frozen fruits, the usual pattern prevailed. Strawberries, the leader, and RSP cherries comprised more than 58 percent of the total pack. It was an exceptionally good year for strawberries, as nearly 273 million pounds was packed, principally on the west coast. This total was 23 percent higher than 1954's. Frozen cherries, most of which are packed in large containers for bakeries, ice cream manufacturers, etc., totaled 114 million pounds, 32 percent higher than 1954.

Practical Refrigerating Engineer

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

ELECTRICAL MAINTENANCE of SWITCHGEAR STARTERS MOTORS in the — Prevention of REFRIGERATING PLANT FAILURES

Proper inspection and testing with adequate instruments prevents costly motor failures

REGIS GUBSER
Educational Director, NAPRE

MAINTENANCE prolongs the useful life of industrial electric apparatus. Specifically, and as its more important objective, preventive maintenance contributes to the success of the process or operation in which the equipment is employed. However, by its very nature preventive maintenance requires the wholehearted interest of the personnel assigned to it. Persons charged with this responsibility should have a keen appreciation as to why the work is required and how important, even the most routine task, is to the overall performance of the equipment.

A truly good electrical maintenance procedure demands a planned and recorded program. Several of the larger electrical manufacturers such as General Electric Co. and Westinghouse Electric Corp. will supply their customers, free of charge, electrical service record cards. Test instrument manufacturers such as Associated Research, Inc. also provide record materials at very nominal cost. These cards have spaces and columns in which to record such data as motor horsepower, type, frame, voltage, amperes, speed, date installed, etc., date when repairs were made, or condition at time of last inspection; also checked by, etc.

Even more modern maintenance programs in critical or seasonal production industries, add a "productive maintenance" plan to the preventive program. In the NAPRE official section of INDUSTRIAL REFRIGERATION, January 1956, page 33, the National Educational Committee published "Productive Maintenance Plans Supplant Preventive Programs", by W. E. Cline, Los Angeles. This paper, based on a nationwide program of one manufacturer was given before many NAPRE chapters in 1955, and subsequently published as an educational article. The equipment record cards shown here in Fig. 2 were used in those talks and with that article. They apply equally well to any good maintenance program.

Records of this nature become more valuable as time goes on and more and more history is recorded on them. They not only show up the strong and weak parts of a particular type or make of motor, but also the location or type of drive that must be checked most frequently.

Regis Gubser, past National President and Educational Director, NAPRE, is Vice-President for Engineering, California Consumers Corp., Los Angeles. He is an electrical engineering graduate of Cal Tech., has taught electric and refrigerating subjects in Los Angeles schools, and is a past contributor of articles on these subjects to both IR and the NAPRE Operating Data Book.

EXECUTIVE OFFICE NAPRE
433 N. Waller Ave.,
Chicago 44, Ill.
OFFICERS
President: Leroy Etzel
San Francisco, Calif.
Secretary, J. R. Kelahan, Chicago 44.

Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, Inc., an educational association, "not-for-profit".

FOAMGLAS®

the cellular, stay-dry insulation

STAYS DRY—Cut a piece from your sample. Place it in water. Note how the hermetically-sealed glass cells filled with dead air keep it afloat. Weight it down for days, weeks or longer if you like. Remove the weight and it bobs back to the surface . . . proof that the sealed cells have absorbed no water, still have their original insulating efficiency.

VAPOR-PROOF — With a nail file, cut a ¼" thick slice from your sample. Hold it to your lips and try to blow smoke through it. The smoke won't penetrate . . . proof that FOAMGLAS is a positive vapor barrier in itself.

STRONG AND RIGID — Place your FOAMGLAS block on the floor. Stand on it. Note how it supports your weight without crushing. Compressive strength is over seven tons per square foot . . . making it ideal for load bearing applications.

WON'T BURN — Hold a flame to your sample. You'll see at once that it does not burn . . . an important safety feature in all construction. It's even acid-proof and rodent-proof as you can prove if you happen to have a vial of acid or a pet rat handy

Send for a sample and make these simple tests!

Prove to yourself that FOAMGLAS is your ideal insulation!

Let us send you a free sample of FOAMGLAS. Use it to make the few simple tests illustrated. You'll prove that this unique cellular glass insulation has exactly the right combination of properties to assure you of these vital benefits: constant insulating efficiency . . . long, maintenance-free life . . . strength and rigidity for a variety of structural applications . . . ease of handling and installation.

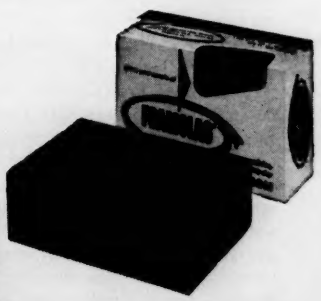
Thousands of actual users have proved in actual performance the benefits so clearly demonstrated by these tests. No wonder, then, that new users every day are picking FOAMGLAS to insulate the roofs, ceilings, walls and floors of all types of buildings, low temperature spaces, piping and equipment. Send for a sample today and make your own tests. Use the handy coupon, or write . . .

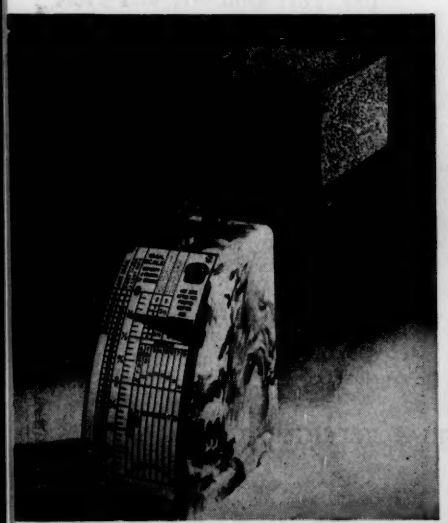
Pittsburgh Corning Corporation

Department T-76, One Gateway Center
Pittsburgh 22, Pa.
In Canada: 57 Bloor Street West, Toronto, Ontario

LIGHT WEIGHT — Just pick up your sample to see how light and easy to handle it is. Check actual weight on your company's postal scale if you wish. The density of FOAMGLAS is only 9 pounds per cubic foot.

EASY TO SHAPE AND CUT—Shave some strips off your sample with an ordinary paper clip . . . workmen use knives, saws or trowels for quick shaping and fitting on the job.





Pittsburgh Corning Corporation
Dept. T-76, One Gateway Center
Pittsburgh 22, Pennsylvania
In Canada: 57 Bloor St. W., Toronto, Ontario

Please send me a sample of FOAMGLAS for testing.

Name_____

Company_____ Title_____

Address_____

City_____ Zone___ State_____

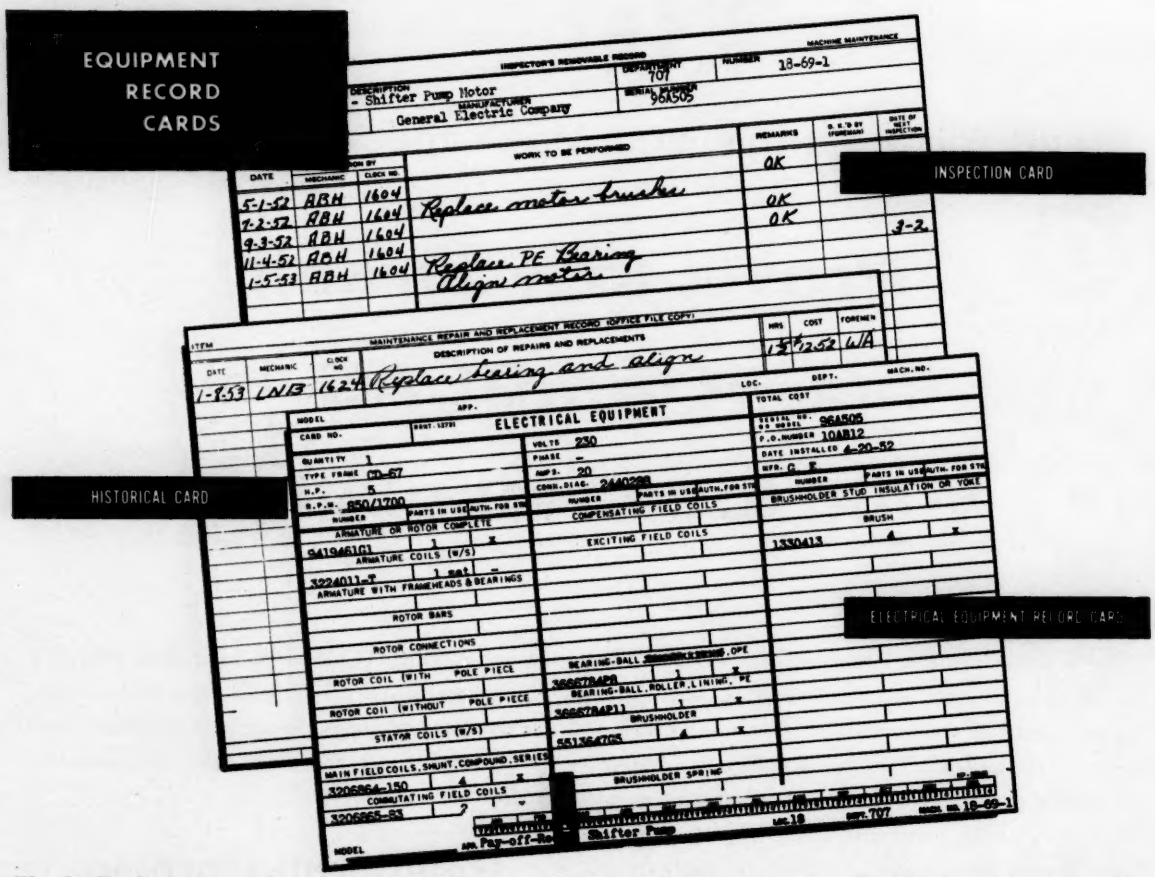


Fig. 2—Equipment record cards are essential to an effective maintenance program. Regular inspections, conscientious recording, and proper filing of the cards are further steps in the successful program — Sample cards, courtesy Remington Rand Co.

From such a record the plant engineer will know what motors cannot be overlooked as time goes on even when he is short of time to check the complete list, but must concentrate on the important ones.

Outlined here is believed to be a good basic program and procedure. Also attempted is a little more detailed coverage of the basic electrical equipment found around a refrigerating plant. If more detailed information is needed about a specific piece of apparatus or about some equipment not mentioned in this paper, there are several books which can be obtained on this maintenance subject that are quite lengthy and in detail. NAPRE's Educational Committee will endeavor to supply names, authors and even some less detailed answers.

Inspection — First Step

First requirement in the satisfactory maintenance of electrical apparatus is competent inspection.

General conditions should be determined by a thorough initial inspection, after which a systematic maintenance schedule should be established. This schedule should include periodic routine inspection. The best time to inspect apparatus is while it is being cleaned.

The inspector should have, at least, a general understanding of the electrical and mechanical characteristics of the apparatus in his care. He should gather sufficient information concerning its correct operating performance to enable him to make minor adjustments and repairs. Further, the inspector should equip himself adequately with hand tools and instruments. Reasonably priced hand instruments, such as clamp-on ammeters, their adapters, etc. (see Fig. 3), should be a part of each inspection kit. Megohm or ohmeter devices as pictured in Fig. 4 and the subject photo on page 31, are part and parcel of the electrician's or engineer's maintenance instruments. Instruction Chart No. 1 lists essentials to the inspection kit.

Instruction Chart No. 1 — Inspector's Equipment

Equipment available for the inspector's use should include the following:

(1) Extension cords and flash light.

(2) Air-gap gauges, spirit level.

(3) Voltmeter and clamp-on ammeter.

(4) "Megger", or ohmmeter.

(5) Thermometer, and tools for disassembling apparatus.

The inspector should also try to provide himself with manufacturer's instruction books pertaining to the apparatus being inspected, if possible.

Inspection Records

The inspector should always record all pertinent information on a card such as shown at top of Fig. 2. Special records covering cleaning, drying, varnish treatment and repairs or reconstruction, are very desirable. Changes in operating conditions or in the location of apparatus should be recorded. Dates are very important.

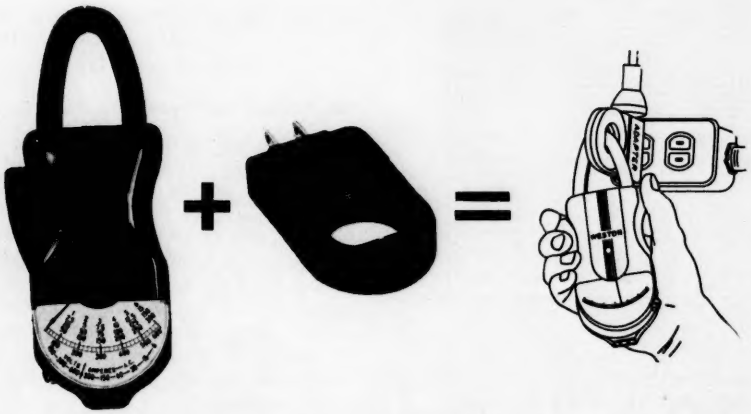


Fig. 3—Relatively inexpensive hand testing instruments are now available to the refrigeration enterprise. A clamp-on volt-ammeter and adapter make circuit testing of single-phase and lighting circuits rather simple — Photos, courtesy Weston Electrical Instrument Co.

Operating Temperatures

Due to inherent characteristics of insulation material in general, high temperature shortens the operating life of electrical apparatus. The total (or actual) temperature, not the temperature rise, should be the measure of safe operation. A relative low temperature rise with a very high ambient may result in a rapid deterioration of insulation. On the other hand a motor may be severely overloaded but installed in a low temperature room and no harm will be done to the motor.

When either the winding or the bearing of a machine not especially designed for high temperature service attains temperatures in excess of 90C (194F), the operating conditions should be investigated. The cause of gradually rising temperatures during a considerable period of time should be found and abnormal conditions should be corrected. Sharply rising temperatures generally warrant a shut-down and a thorough examination of the apparatus.

Insulation

Electrical insulation is defined as any non-conductor of electricity. Material commonly used as insulators are non-conductors only when clean and dry, hence proper maintenance is essential.

Electrical apparatus should be kept reasonably free from accumulations of dirt so that ventilating ducts may function and so that low resistance paths may not be formed between line parts.

Cleaning may be by scraping, blowing by compressed air, or removing dirt by suction. If a solvent is necessary to remove oil or grease, it is recommended that a petroleum solvent of the safety type be used exclusively.

A word of caution when using compressed air: Be sure the air is dry and does not carry water. Do not use air pressure greater than 50 psi. Too high air pressure may damage insulation. Be careful not to blow the dirt into some inner recess from which it will be difficult to remove.

And above all, wear goggles when blowing out ducts with compressed air.

Drying Electrical Insulation

Electrical apparatus, after cleaning, storing or shipping must be dried before being placed in operation if tests indicate that the insulation resistance is below a safe minimum value. Moisture may be derived from (a) exposure to rain, snow, or fog during shipment or storage. (b) exposure to humid conditions. (c) cleaning with water or steam.

This is where the use of the "Megger"[1], "Vibrotest"[2] or megohmmeter becomes an almost necessity. These instruments measure the resistance of the insulation, and since moisture lowers the insulation value of the dielectric material, the "Megger" or Vibrotest" will indicate when the motor is dry.

A typical insulation drying curve is plotted in Fig. 5.

A safe general rule is that the insulation resistance should be approximately 1 megohm for each 1000 volts of operating voltage with a minimum value of 1 megohm.

Methods Of Drying

There are two general methods of drying the insulation of windings:

[1]"Megger" is the registered trade mark of the insulation resistance testing instrument manufactured by Jas. G. Biddle Co., Philadelphia, Pa.

[2]"Vibro-test" is the registered trade mark of the insulation resistance testing instrument manufactured by Associated Research, Inc., Chicago, Ill.

Fig. 4—Portable Ohm-meters for testing electrical insulation resistance such as the "Vibro test" shown here are available for less than cost of a new one-horsepower motor.—Photo, courtesy of Associated Research, Inc.

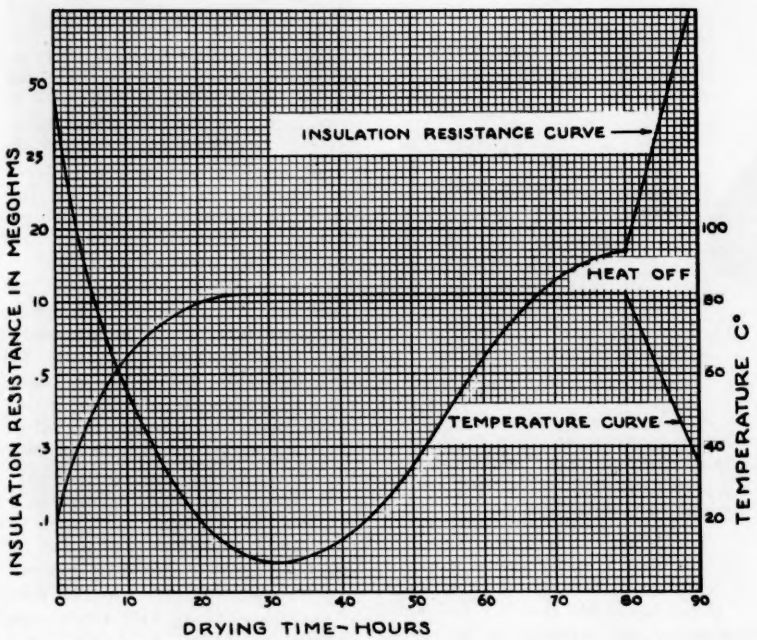


Fig. 5—Insulation resistance depends upon dryness of the material. Plotted here, resistance and temperature curves, readily indicate to the engineer the number of hours required to dry out wet motor windings to a safe resistance value.

(1) *External Heat.* A permanent drying oven will be a good investment for a large industrial or power company operating motors which may be in damp locations. Heat for such ovens is usually supplied from steam coils or electric heaters. When an oven is not available a suitable cover or enclosure plus a source of heat will probably do. Infra red lamps may be found to be desirable in some cases. Care should be taken not to over-heat the insulation.

(2) *Drying with Internal Heat.* The coil insulation of wound electrical apparatus may be dried by circulating current through the windings. Internal heat can be developed in this way without subjecting the insulation to voltage that might damage it during the drying operation.

However, there is always danger of serious injury to the windings when drying the insulation with current since the heat generated in the inner parts is not readily dissipated; furthermore, coils containing moisture are much more susceptible to injury from overheating than they are when thoroughly dry. *This method should be followed only under competent supervision.*

Voltage Checks

Unbalanced voltage may seriously affect the operation of sensitive apparatus, and single phase operation is almost certain to result in damage to polyphase motors (See Fig. 6). Voltage readings taken at the terminals of a three-phase motor which will not start may be misleading, for even if one line is open at the transformer or starter, voltage will be indicated between all three lines at the motor if another three-phase motor has continued to run single phase on the same circuit. The following factors should be noted:

(1) A variation in voltage not exceeding 10 percent is generally permissible.

(2) Higher voltage will result in decreased power factor, increased torque, decreased slip, increased efficiency, and decreased temperature.

(3) Low voltage will result in increased power factor, decreased torque, increased slip, decreased efficiency, and increased temperautre.

Rotating Apparatus

Rotating equipment such as motors and generators require scheduled maintenance in order to keep them in good operating condition. The three principal causes that contribute to faulty operation of this type of equipment are accumulation of dirt, dust or other foreign matter on the windings and moving parts; lack of sufficient lubrication or improper lubrication of bearings and other moving parts; and improper adjustment or imperfect conditions of the moving parts. Given proper maintenance, motors and generators will give long and efficient service. If they are neglected, they fail.

AC Induction Motors

The stator (stationary) windings appear to be so simple and rugged as to cause one to frequently overlook the necessity for certain maintenance procedure. However, a glance into the average motor repair shop such as in Figs. 6 & 7, will make it apparent that the induction motor stator is after all a vulnerable piece of equipment. Most of the work going on will be replacing or repairing stator windings.

Stator troubles can usually be traced to one of the following causes:

Worn Bearings
Moisture
Overloading
Operating Single Phase
Poor Insulation

Dust and dirt are usually contributing factors. Some forms of dust are highly conductive and contribute materially to insulation breakdown, such as salt-laden air around an ice tank.

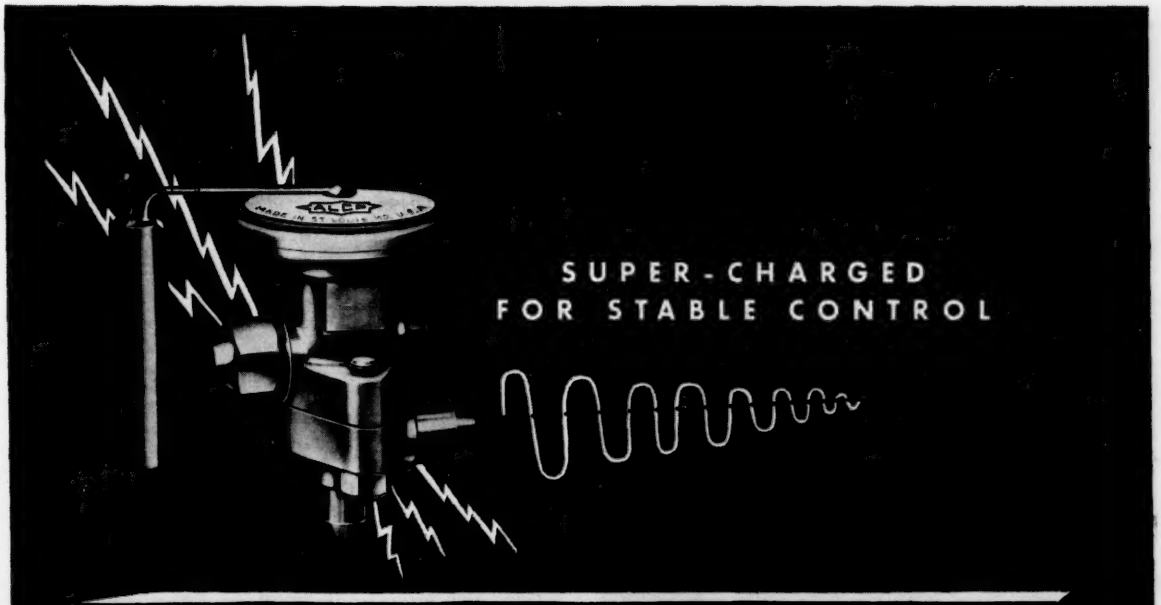
Needless to say, motor insulation must be kept reasonably dry, although many applications around a refrigerating plant make this practically impossible. If operated in a damp place, special moisture resisting treatment should be given the windings.

Maintenance Of Rotor Winding

The rotors of wound rotor motors have many features in common with the stators; therefore, the same comments apply to the care of rotor winding as are given for care of stator windings.

Most wound rotors have a three-phase winding, and are therefore susceptible to trouble from single phase operation. The first symptom of an open rotor circuit is lack of torque, with slowing down in speed, accompanied by a growling noise, or perhaps failure to start the load. The first place to look for an open secondary circuit is in the resistance grids or the control circuit external to the rotor (See Fig. 8). Short-circuiting the rotor circuit at the slip rings and then operating the motor will usually determine whether the trouble is in the control circuit or in the rotor itself. It may be in one of the stud connections to the slip rings.

A ground in a rotor circuit will not affect the performance of the motor unless another ground should also develop, which might cause the equivalent of a short circuit in which case it would have the effect of un-



ALCO SUPER CHARGES

Range (Evaporator Temperatures)	Charge Type	Application Examples	Refrigerant: Freon-12 †(Yellow)	Freon-22 †(Green)	Methyl Chloride †(Red)	Carrene-7 †(Orange)	Propane †(Black)
			Charge Symbol				
30° F. to 50° F.	Gas	Air Conditioning, Water Chillers, Etc.	*55# MOP FG	*100# MOP HG	*35# MOP MG	*65# MOP CG	*100# MOP PG
0° F. and Above	New Improved Liquid Charge	Industrial, Commercial, Display Cases, Unit Coolers, Etc.	F	H	M	C	P
0° F. to —40° F.	Low Temperature Cross Charge	Locker Plants, Freezers, Hardening Rooms, Cabinets, Etc.	FZ	HZ	MZ	CZ	PZ
"X" CHARGE (ZZ VALVES)							
—40° F. and Below	Ultra Low Temperature Cross Charge	Altitude Chambers, Scientific Equipment, Industrial Processing, Etc.	FX	HX			PX

* The M.O.P. (Maximum Operating Pressures) shown above are standard. Others available upon request.
† Color of nameplate identifies refrigerant.

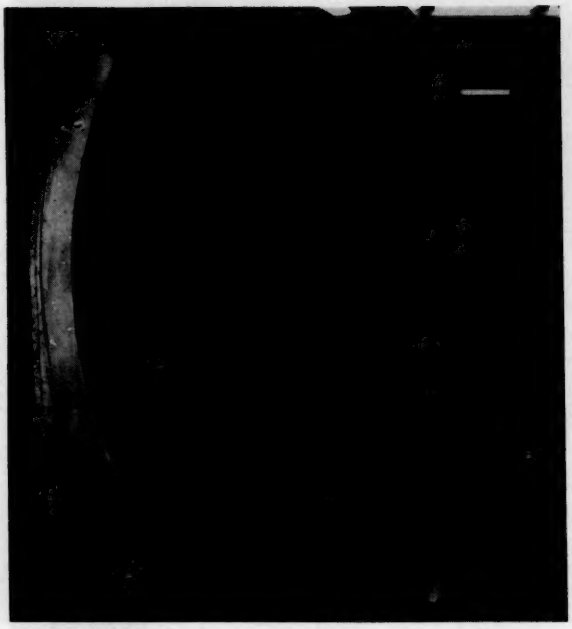
. . . straight-through or angle connections . . . solder or SAE flare.
For all temperature ranges—all operating conditions.
Specify type desired when you order.

SEE YOUR ALCO WHOLESALER **ASK FOR BULLETIN 171-56**

835 KINGSLAND AVE. • ST. LOUIS 5, MO.

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

7085



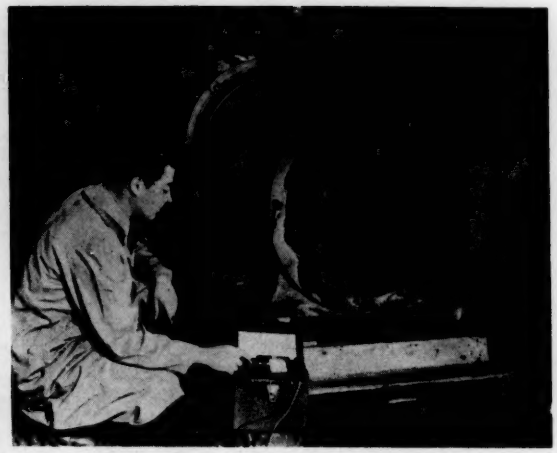


Fig. 6 (left)—Stator winding burnout from single-phase operation

Fig. 7 (above)—Testing field coil insulation following repairs and prior to shipment — Photo, courtesy of Associated Research, Inc.

balancing the rotor electrically. In addition to reduced torque, another symptom of this condition might be excessive vibration of the motor, also sparking and uneven wear of the collection rings.

Another manner of checking for short circuits in the rotor windings, is to raise the brushes off the slip rings and energize the stator. If the rotor winding is free from short circuits, it should have little or no tendency to rotate, even when disconnected from the load.

Good maintenance procedure calls for periodically checking the air gap with a feeler gauge to insure against a worn bearing that might permit the rotor to rub the laminations. These measurements should be made on the shaft end of the motor.

On large machines, it is desirable to keep a record of these checks. Four measurements should be taken approximately 90 degrees apart, one of these points being the load side. A comparison of the new measurement with those previously recorded will permit the early detection of bearing wear. A very slight rub will generate heat sufficient to destroy the coil insulation.

Commutation Maintenance

The most important factor, and the one upon which the success or failure of any direct current machine depends is commutation.

In power and industrial work, commutators may become rough through overloading, which produces excessive sparking or burning, and overheating. Threading or grooving of the commutator may be caused by foreign matter imbedded in the brushes, or improper grade of brush carbon, or too heavy a load for the size or grade of brush. Commutation trouble can start from loose bars, high mica, shorts or open circuits in the armature windings and from brushes not being properly spaced both electrically and mechanically.

Resurfacing of a commutator should always be done in a lathe whenever possible. However, if a commutator is concentric, a hand stone can be used in an emergency, if one uses it carefully with the machinery running at its rated speed. On very large machines the grinding stones can be attached to the brushholder bracket arm and rigged up like a lathe tool so as to obtain maximum rigidity.

After grinding, all commutator slots should be cleaned and the edges of the bars beveled. This beveling accomplishes two things:

1) Removes the burrs

2) Eliminates the sharp edges at the entering side of the bar under the brush.

If enough copper is ground or turned off so that the undercutting will be shallow, the commutator should be re-undercut to a depth of 1/16-in. This is done by means of a small circular high-speed saw about .003-in. thicker than the nominal thickness of the mica. In undercutting, great care must be taken to see that a thin sliver of mica is not left against one side of the slot. Sometimes this sliver must be removed by hand scraping.

Brushholder spacing must be uniform around the commutator within 1/32-in. This can be checked by passing a tape around the commutator and marking the position of one brush on each arm. Brushholders should also be adjusted so that there is about 1/8-in. maximum clearance between brush boxes and the commutator.

Brushholder arms should be staggered in pairs in an axial direction approximately 3/8-in. to prevent grooving of the commutator. DC brushholders should be adjusted so that the pressure on all brushes is as uniform as possible. This prevents selective action by which certain brushes may take more or less than their proper share of the load. The pressures used vary considerably with the grade of brush and the type of service, and should be obtained from the Instruction Book provided for the generator or motor. Brushes should also be checked frequently to make sure that they move freely in the holders. Any brush found sticking can be freed by sanding the high spots with fine sandpaper.

Bearings And Lubrication

Bearings and lubrication are of the greatest importance regardless of the size of the apparatus. In 1955, an analysis by the Hartford Steam Boiler Inspection and Insurance Co.[3] of synchronous motor failures shows the bearings to be among the top three principal causes of failures. Another survey of induction motors showed bearings to be the principal cause, with 80 percent of failures caused by poor lubrication. Motor damage fol-

[3]See pg. 17, INDUSTRIAL REFRIGERATION, October 1955.

lows because failure of a bearing allows the rotor to rub against the stator.

Sleeve bearing design in general is based on the fluid theory of lubrication. Bearing surfaces are nearly always made of a good quality tin base babbitt or bronze material, both softer than the shaft. The oil used to keep these surfaces separated is of such a weight and viscosity that will suit the load on the shaft and the temperature the bearing is going to operate at.

Bearing reservoirs should be filled to the proper level when the machine is stopped, and should be checked at regular intervals depending on the operating characteristics of the machine. Oil rings should be checked to see if they rotate properly; that is, not too fast or too slow.

Oil leakage should be checked to see that it is not excessive. The bearing seals and bleed holes should be inspected at regular intervals, as excessive lubrication on windings is very detrimental to the windings of any machine. The same surveys mentioned above indicated 15 percent of stator and 19 percent of rotor failures due to insulation deterioration were caused by dirt and oil leakage.

Ball And Roller Bearings

Ball and roller types are replacing more and more of the sleeve bearings, especially in the small and medium size machines, because they require less attention of the operator or maintenance man. Good bearing operation and maintenance require proper alignment, protection from corrosion, cleanliness and proper lubrication.

Inspection: Never open the bearing housing under conditions which would permit entrance of dirt. External inspection of the motor at the time of first greasing soon after it is put into operation will determine whether the bearings are operating quietly and without undue heating.

Further inspection will not be necessary except at infrequent intervals, probably at greasing periods. If practical, it is desirable for the most satisfactory service to open the bearing housings once a year or after 8,000 to 10,000 hours of operation, to check the condition of the bearings and grease.

Ball bearings require high grade lubricant because of the severe churning action. The viscosity and other characteristics of the lubricant will depend upon the temperature and environment in which the machine is to operate.

A word of caution:

DO NOT OVER LUBRICATE

A small amount of lubricant is essential; sufficient to maintain a film of lubrication over the surface of the balls and races. Too much grease will cause overheating and grease leakage.

Induction Motor Starters

Starting equipment for squirrel cage AC motors may be divided into three general types:

Manual Starter: These are available up to 5 hp at 550-volt, 3-phase; either toggle type, or the drum type which is frequently used for reversing service.

Magnetic Line Starters: These are the type most frequently used and are suitable over a wide horse power and voltage range.

Reduced Voltage Starters, both manual and automatic: This type starter of the auto-transformer type finds extensive application where the size or design of the motor or restrictions of the supply circuit require starting on reduced voltage. The auto-transformer type starter

DEMON MOISTURE
can't get to your insulation...
when it is erected with
cold-applied ENAMELITE®

Here you see a "demon"-stration of what *can't* happen to rigid-type, low-temperature insulation when it's properly erected with ENAMELITE No. 330. Moisture-vapor penetration is effectively stopped by Enamelite's dense, adhesive bond.

Performance records on job after job over a 25 year period prove that Enamelite helps maintain the efficiency and life of the bonded insulation indefinitely.

Conveniently cold-applied Enamelite maintains its volume constancy, develops a bonding strength many times actual requirements to adhere insulation to walls and ceilings, and forms a permanent, moisture-vapor barrier.

DO YOU HAVE A COPY OF THE ENAMELITE CATALOG?
A copy is yours on request.

PRESSTITE SEALING COMPOUNDS
PRESSTITE-KEYSTONE Engineering Products COMPANY
DIVISION OF AMERICAN-MARIETTA COMPANY
3772 Chouteau Avenue, St. Louis 10, Missouri • 101 E. Ontario Street, Chicago 11, Illinois
K A P

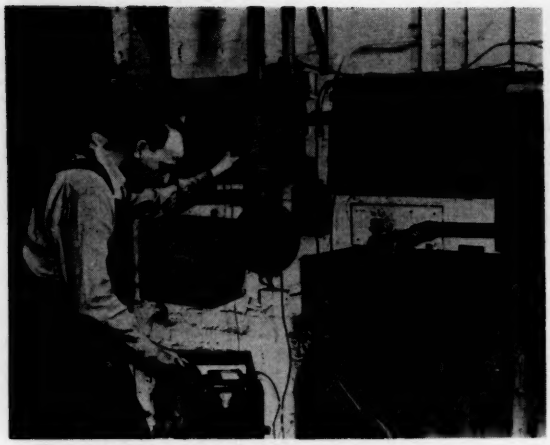


Fig. 8 (left)—External circuit testing gives a clear, quick, accurate picture of equipment condition — Photo, courtesy of Associated Research, Inc. Fig. 9 (right)—Testing motor insulation resistance. In-place and other maintenance tests are performed best with instruments such as the "Megger" being used here by the maintenance electrician and engineer — Photo, courtesy of Jas. G. Biddle Co., Philadelphia.

provides greater starting torque for ampere starting current drawn from the line than other types of reduced voltage motor starters. Instruction Charts Nos. 2, 3, 4 and 5 give rules for maintenance inspection of these various starters and switchgear.

Instruction Chart No. 2 — General Rules

On all squirrel cage induction motor starters, the following general considerations must always be observed:

(1) Before removing cover to inspect or adjust starter, make sure that disconnecting switch is open and control circuit is dead.

(2) Remember that all parts must be kept dry and clean. This is of fundamental importance.

(3) Inspection should be made at regular intervals for best results. In general, monthly inspections will be sufficient, though in particularly severe service, it may be desirable to inspect oftener.

Instruction Chart No. 3 — Maintenance of Manual Starters

On the types employing a toggle switch with a quick make and quick break, there is practically no maintenance except to check tightness of connections and be sure that heaters for overload relay are tight.

On the oil immersed drum type, it is well to:

(1) Check all connections.

(2) Observe wear on removable contact tips and replace when 2/3 worn away.

(3) Replace oil when it becomes dirty or badly carbonized.

(4) See that all parts are clean and move freely.

Instruction Chart No. 4 — Maintenance of Magnetic Line-starters

Following maintenance precautions and instructions are recommended:

(1) Do not lubricate contact tips or bearings.

(2) Magnet sealing surfaces should occasionally be wiped with an oil moistened cloth to prevent noise and rust.

(3) Check tightness of all connections, and particularly connections to overload heaters, since a loose connection here will cause local heating that will affect the calibration of the relay[4].

(4) Make sure that shunts are not broken or touching other parts.

(5) Contacts should be adjusted so that they will all make at the same time.

(6) In general, the contacts will not need attention during normal life. If they become excessively rough or burned in service, they should be dressed with sandpaper or a fine file. Do not use emery cloth. Contact tips should be replaced when approximately 2/3 of their thickness is worn away. These are removable, and only a screw driver is needed for the change.

(7) Any excess deposits should be removed from the inside surfaces of the arc boxes adjacent to the contacts, and any broken arc boxes should be replaced.

(8) See that all moving parts work freely.

(9) Disconnect motor and manually test the start button, the stop button, the overload relay and reset.

Instruction Chart No. 5 — Maintenance of Reduced Voltage Starters

The maintenance requirements listed under linestarters apply also to reduced voltage starters commonly known as auto-starters. In addition, the following points should also be checked:

(1) The moving part of the low voltage release mechanism should be carefully examined to see that it works freely.

(2) Many of these starters use an overload relay of the magnetic type having an oil dash-pot to prevent tripping on momentary overloads. Care must be taken to see that the piston is not binding in the dash pot and that the dash-pot is filled to cover the piston with the proper grade of dash-pot oil.

---

[4]Most industrial line-starters are provided with overload relays whose action depends on the movement of a bi-metallic strip under heat. On very small motors, the bi-metallic strip actually carries the motor current, but on larger ones, a separate heater carrying the motor current is placed close to the strip. On still larger motors, a current transformer reduces the motor current to a value that can be handled by the heater.

CUT OUT HERE

For Your Fact File!

COMPARATIVE REFRIGERANT CHARACTERISTICS OF genetrons® AND OTHER BASIC REFRIGERANTS

(PERFORMANCE BASED ON 5°F EVAPORATOR TEMPERATURE AND 86°F CONDENSER TEMPERATURE)

	genetron 11 Trichloro-monofluoro-methane	genetron 12 Dichloro-difluoro methane	genetron 141 Monochloro-difluoro methane	genetron 226 Trichloro-trifluoro-ethane	Carrene 7	Methyl Chloride	Ammonia	Sulfur Dioxide
Chemical Formulae	CCl_3F	CCl_2F_2	$CHClF_2$	$C_2Cl_3F_3$	Note 1	CH_3Cl	NH_3	SO_2
Molecular Weight	137.4	120.9	86.5	187.4	99.3	50.5	17.0	64.1
Boiling Pt. (°F) at 1 Atmosphere Pressure	74.7	−21.6	−41.4	117.6	−28.0	−10.8	−28.0	14.0
Evaporator Pressure at 5°F (p.s.i.g.)	24.0*	11.8	28.3	27.9*	16.4	6.5	19.6	5.9*
Condensing Pressure at 86°F (p.s.i.g.)	3.6	93.2	159.8	13.9*	113.4	80.0	154.5	51.8
Freezing Point (°F) at 1 Atmosphere Pressure	−168	−252	−256	−31	−254	−144	−108	−104
Critical Temperature (°F)	388	233	205	417	221	289	271	315
Critical Pressure (p.s.i. absolute)	635	582	716	495	631	969	1657	1142
Compressor Discharge Temperature (°F)	112	100	131	86	105	172	210	191
Compression Ratio (86°F/5°F)	6.24	4.07	4.06	8.02	4.12	4.48	4.94	5.63
Saturated Liquid Viscosity at 5°F (centipoises)	0.650	0.328	0.286	1.200	—	0.293	0.250	0.503
Saturated Liquid Viscosity at 86°F (centipoises)	0.405	0.251	0.229	0.619	—	0.234	0.207	0.281
Vapor Viscosity at 5°F & 1 Atmosphere Pressure (centipoises)	0.0096	0.0114	0.0114	0.0093†	—	0.0095	0.0085	0.0111
Vapor Viscosity at 86°F & 1 Atmosphere Pressure (centipoises)	0.0111	0.0127	0.0131	0.0105†	—	0.0109	0.0102	0.0131
Saturated Liquid Density at 5°F (lbs./cu.ft.)	97.88	90.00	83.34	103.20	80.11	61.65	41.11	92.00
Saturated Liquid Density at 86°F (lbs./cu.ft.)	91.38	80.63	73.36	96.96	71.23	56.24	37.16	84.44
Saturated Vapor Density at 5°F (lbs./cu.ft.)	0.0815	0.6735	0.8034	0.0370	0.657	0.2237	0.1227	0.1558
Saturated Vapor Density at 86°F (lbs./cu.ft.)	0.4461	2.569	3.213	0.2569	2.598	0.9253	0.5643	0.8440
Specific Volume of Saturated Vapor at 5°F (cu.ft./lb.)	12.27	1.49	1.25	27.04	1.52	4.47	8.15	6.42
Latent Heat of Vaporization at 5°F (B.t.u./lb.)	84.0	69.5	93.6	70.6	—	180.7	565.0	169.4
Net Refrig. Effect of Liquid (86°F/5°F) (B.t.u./lb.)	67.5	51.1	69.3	53.7	61.1	150.2	474.4	141.4
Specific Heat of Liquid at 86°F (B.t.u./lb. °F)	0.21	0.24	0.34	0.22	—	0.39	1.14	0.39
Specific Heat of Vapor at Constant Pressure of 1 Atmosphere & 86°F (B.t.u./lb.°F)	0.13	0.15	0.15	0.15	—	0.24	0.51	0.15
Specific Heat Ratio at 86°F & 1 Atm. (k=Cp/Cv)	1.14	1.14	1.18	1.09	—	1.20	1.32	1.29
Coefficient of Performance	5.09	4.70	4.66	4.92	4.61	4.90	4.76	4.87
Horsepower/Ton Refrigeration	0.927	1.002	1.011	0.960	1.022	0.962	0.989	0.968
Refrigerant Circulated/Ton Refrig. (lbs./min.)	2.96	3.92	2.89	3.73	3.27	1.33	0.422	1.41
Liquid Circulated/Ton Refrig. (cu.in./min.)	56.0	83.9	68.0	66.5	79.3	40.9	19.6	28.9
Compressor Displacement/Ton Refrig. (c.f.m.)	36.32	5.81	3.60	100.76	4.97	5.95	3.44	9.09
Thermal Conductivity of Saturated Liquid at 32°F (B.t.u.ft./ft.²hr. °F)	0.0680	0.0559	0.0704	0.0576	—	0.103	0.29	0.122
Thermal Conductivity of Saturated Liquid at 86°F (B.t.u.ft./ft.²hr. °F)	0.0609	0.0492	0.0595	0.0521	—	0.089	0.29	0.111
Thermal Conductivity of Vapor at 32°F & 1 Atm. Pressure (B.t.u.ft./ft.²hr. °F)	0.0045	0.0048	0.0060	0.0038‡	—	0.0053	0.0128	0.0050
Thermal Conductivity of Vapor at 86°F & 1 Atm. Pressure (B.t.u.ft./ft.²hr. °F)	0.0048	0.0056	0.0068	0.0045‡	—	0.0065	0.0145	0.0056
Stability (Toxic Decomposition Products)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Toxicity (Underwriters' Laboratories Group No.)	5A	6	5A	4-5	5A	4	2	1
Flammability	None	None	None	None	None	Yes	Yes	None
Relative Dielectric Strength of Vapor (compared with Ethyl Chloride as Unity)	3.00	2.40	1.31	2.60	—	1.06	0.82	1.90
Odor	Ethereal	Ethereal	Ethereal	Ethereal	Ether.	Ether.	Acrid	Acrid
Type of Compressor in Which Usually Used	Cen.	All	Rec-Rot	Cen.	Rec-Rot	All	All	Rec.
Evaporator Temperature Range, °F	−20 to 50	−100 to 50	−125 to 50	−25 to 50	−100 to 50	−80 to 50	−90 to 20	−60 to 50
Water Sol. in Liq. Refrig. at 32°F (gms./100 gms. Refrig.)	0.0036	0.0026	0.060	0.0036	—	0.026 at −10°F	High	High
Water Sol. in Liq. Refrig. at 86°F (gms./100 gms. Refrig.)	0.013	0.012	0.15	0.013	—	—	High	High
Oil Solubility (Miscibility With Lubricating Oils)	Yes	Yes	Partial	Yes	Yes	Yes	No	No

*Inches of mercury vacuum †At. 0.1 atmosphere ‡At. 0.5 atmosphere

Note 1. Carrene 7 is an azeotropic mixture of Genetron 100(CH_2CHF_2) and Genetron 12(CCl_2F_2)

Genetron Super-Dry Refrigerants are available from Refrigeration Wholesalers throughout the country.

GENERAL CHEMICAL DIVISION • ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

(3) The setting of the overload relay should be checked and should be at least 115 percent full load motor current for 40 C rise open type motors. Read the setting where the calibration line on the dash-pot coincides with the bottom of projection on the upper casting.

(4) Above 50 hp at 60 cycles, and above 550 volts it is customary to use insulating oil in the pan so that contacts will make and break under oil. The pan should be filled with oil to the oil level mark. If the oil becomes badly discolored or carbonized from service, it should be replaced with new oil after carefully cleaning the pan.

(5) In automatic starters of this type a definite time relay is used to control the time on the starting tap. The timing of this relay should be checked, and if a type using an oil dash-pot is employed, care must be taken to see that it is filled with oil, with low pour test suitable for low temperatures.

(6) The starting transformers are provided with taps by which the starting voltage can be varied. The proper taps to use are those that will bring the motor up to speed in 20 seconds or less on motors up to 100 hp. On 200 hp motors the starting period may be 30 seconds. Periods longer than these may seriously overheat the transformer.

Starting Controllers For Wound Rotor Motors

Special attention should be given to the maintenance of the secondary control of wound rotor motors, particularly those used in speed regulating service, since in a large percentage of applications, it is possible for faults to develop through normal wear without causing either immediate shutdown or failure to start. A similar fault in the primary circuit would force immediate correction of the trouble.

Since the motor will continue to start and operate even though an actual open circuit or serious unbalance of resistance may exist in the secondary circuit at certain points on the controller, it is not always understood or appreciated that this condition may result in (1) roasting out of the rotor windings, (2) burning of brushes and collector rings, (3) overheating of resistors.

Also, undue stress on the equipment may be produced when smooth steps of acceleration provided by control are lost by poor or no contact at certain points on the controller. Such conditions may develop without the operator either noting or reporting any difficulty until serious breakdown occurs, when it will be recalled that they "did have to notch the controller up a step" or that "it has jumped a bit on that point."

A definite and regular inspection schedule is essential, not only for these reasons, but also because this class of apparatus is of such rugged design and construction that it requires a minimum of attention and may therefore be neglected.

Secondary Controllers

To insure against service interruptions and keep all tyeps of secondary controllers in good operating condition requires only regular inspection, cleaning and the maintaining of contacts. Some arcing and burning of contact making parts is unavoidable and these should be kept smooth to insure positive low resistance contact at all times. Sandpapering or occasional dressing with a file may be necessary. The contacts should be lightly lubricated with vaseline after dressing and cleaning.

Resistors can be readily checked for continuity by testing across rheostat contacts or controller fingers, or perferably by raising brushes at the motor collector rings and connecting test lamp, ohmmeter or other available testing equipment across brushholders or outgoing leads (as shown in Fig. 9) and moving the secondary controller through its full sequence step by step. If repeated across each phase, this will verify both continuity of resistors and tap connections as well as indicating any open contacts in controller.

However, since the values of secondary resistance are relatively low, actual measurements of resistance values on each step are not possible with equipment available in many plants and in these cases more careful visual inspection must be made to locate and correct any loose connections or low pressure contacts. Tap connections on grid type resistors, if found movable by hand or showing evidence of heating, should be removed, cleaned, replaced and pressure of contact increased by taking up on the pressure nuts at the ends of the grid assembly. On ribbon wound resistors, the clamp type connections should be tightened.

New Installations

On new installations, at least two inspections should be made at short intervals after placing in service to insure that all contact remain tight after heating and cooling of resistors in service. Since a large amount of heat energy is liberated from resistors, equipment must be located to allow adequate air space and ventilation. Underwriters and local building codes should be followed.

Maintenance of Fuses[5]

Inspect the fuse ends for evidence of overheating and corrosion, and fuse clips for dirt and looseness. Tighten the end caps on replacement fuses, the fuse clips and connections to the clips, if necessary. The tension on the fuse clips may be increased by pressing the sides closer together. If necessary, pliers may be used to adjust the tension.

Clean all fuse ends and fuse clips with #0000 sandpaper. Then wipe them with a clean cloth. If it is necessary to use a file to remove deep pits in the fuse clips, fuse ends or contacts, always finish with fine sandpaper in order to leave a smooth contact surface. Then wipe the surface with a clean cloth.

Preventive Maintenance

Preventive maintenance may be defined as a systematic series of operations performed periodically on equipment in order to prevent breakdowns. This is in sharp contrast to trouble shooting and repair, which locate and correct existing defects.

Preventive maintenance procedures are designed to:

(1) Protect the equipment from the detrimental effects of dirt, dust and moisture.

(2) Keep the equipment in such condition as to insure uninterrupted operation for the longest possible period of time.

(3) Maintain the equipment so that it will always operate at highest possible efficiency.

(4) Prolong the useful life of the equipment.

The importance of preventive maintenance cannot be over-emphasized. It acquires its proper significance when it is examined from the point of view of equipment utility.

Equipment must be kept running efficiently if it is to serve its purpose. Equipment that is improperly maintained will rapidly become useless.

CAUTION

Before performing any preventive maintenance work on electric apparatus, make certain that all power has been removed from the equipment, that capacitors have been discharged if there are any, and circuits grounded before touching them.

[5]For fuse testing, see "Trouble Shooting on Motor Control Circuits", by Frank Vitt, 1955 NAPRE Operating Data Book.

News Notes and Chapter Activities

Colton Tours Etiwanda

San Bernardino—Southern California Edison Company's new electric steam power plant at Etiwanda, California, was the scene of Colton chapter's April 11th meeting. The ladies were present and made the tour of this latest addition to the rapidly growing power network in this area of Southern California.

Prior to the field trip the group met at Harold's Cafe in Fontana for dinner. Those present were J. Richard Kelahan, National Secretary; National Past President E. T. Quinn; and Junior Past President, Regis Gubser, both of Los Angeles. Other Los Angeles members making the trip were Mr. and Mrs. L. H. Benedict; National Board Chairman, William R. Burnett, and National Membership Chairman, George Paulick. Chapter 5 officers and their ladies present were Mr. and Mrs. L. G. Schroeder, Mr. and Mrs. A. W. Franklin, Mr. and Mrs. C. H. Purkiss, H. O. Bonter and C. F. Hippensteil, a guest.

Floor Insulation Discussion

Discussed at length before the May 9 meeting held at the Santa Fe Ice plant, was the topic of Floor Insulation. The principal type that brought up the discussion was a concrete floor with an insulating material used as an aggregate. Several members had experienced trouble with this type of floor, the floor going bad after only a few years of service. Apparently moisture pentrates the pores and collects around the insulation aggregate. The concensus was that the aggregate deteriorates in the same manner as lumber dry-rot, and the floor breaks up due to alternate freezing and thawing of the moisture.

The second portion of the evening's discussion concerned a valve that appeared in several month's of advertising by one firm in NAPRE's official organ, INDUSTRIAL REFRIGERATION. As suggested by NAPRE's Publication Chairman, Erich Utescher, our program committee used the illustration as an educational topic. The members derived a good deal of benefit from the discussions that came about.—H. O. BONTER.

Witness NH_3 Manufacturing

Stockton-Modesto—Chartered Greyhound Buses carried chapter members from the area to the Pittsburgh, California, Ammonia Plant of the Dow Chemical Company, on April 17. Assistant Superintendent of the Electro-Chemical plant, Boyd Handelin, assisted by other Dow personnel, conducted the tour through the ammonia plant. The hosts were detailed in their explanations of the plant operation, especially the ammonia production end. Following the tour, chapter members were treated to dinner in the Dow cafeteria. At this meeting three new members joined our chapter. The three men, employed by the Turlock Refrigerating Company, Turlock, California, are Alfred C. Johnson, C. H. Sheffield, and J. A. Walls.—HARRY DYER

Memphis Defrosting Talk

Memphis—Instructor H. L. Todd of Tennessee Chapter No. 1, NAPRE, at the May 16 meeting, lectured on Defrosting Methods. Todd had several bulletins on various types of refrigeration coils, blower units and evaporators which he distributed. He explained various methods of defrosting coils; namely, natural defrosting, scraping, water, electric and hot gas. He also went into continuous defrost solutions such as the Niagara "No-Frost" system. Todd explained that the ultimate in defrosting is the continuous system such as "No-Frost" or "Kathene" solutions, but also cited a few shortcomings. However, the short-comings eventually boil down to the fact that operating engineers often did not understand the system and the short-comings were of their own making. Several members took the floor and explained their experiences with defrosting problems. The Chapter voted to recess the educational meetings during June, July and August. Past National Membership Chairman John T. Dabbs, attended the meeting and formally requested a transfer of his membership from St. Louis to Memphis.—CHAS. CONLEY.

(Continued on page 46)

AMMONIA Wolf-Linde VALVES

Standard of Quality Since 1880

WOLF — LINDE AMMONIA VALVES, of high strength semi-steel, offer in Type 1, threaded bonnets, with 1-piece hardened and ground stems. Sizes up to and including 1" IPS.

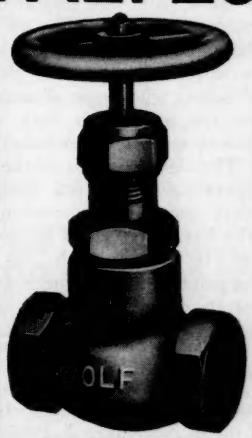
W-L AMMONIA VALVES, Type 2, have bolted bonnets, with disc held to stem by a positive locking pin. Sizes include 1¼" IPS and up.

WOLF-LINDE AMMONIA FITTINGS for standard applications include flanged and reducing Tees, flanged Elbows, Check Valves, Strainers. Drop forged steel screwed fittings are also offered.

Many special fittings and items for non-standard applications are also available. Your inquiry invited.

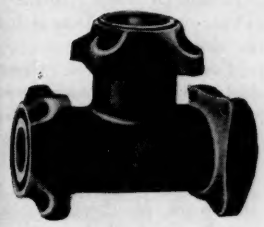
Write for free Catalog

- **AMMONIA VALVES & FITTINGS**
- **EVAPORATOR PRESSURE CONTROLS**



Screw End Globe Valve

Flanged Globe Valve



Flanged Tee

DERSCH, GESSWEIN & NEUERT INC.

4849 W. GRAND · CHICAGO 39

From the President's Desk

Conservation and Convention Committees Step Up Activities Through the Summer

JULY is the month for membership conservation. Chapter and the National Membership-at-Large Conservation Committees should remain active during the summer season when most other Chapter committees are on vacation. Collection of dues always seems to run in a set pattern. There are always those that let the invoice for the current year's dues remain in the bottom of the basket expecting to remit in a day or so, and then forget.

To date our delinquent members have cost National Headquarters nearly five hundred dollars in its efforts to get in the last two thousand dollars in delinquent dues.

This amount of money would purchase over 100 BASIC REFRIGERATION texts for our new members, or supply a complete mailing of a useful or practical reprints of refrigeration articles to our entire membership. If the dues do not come in, the added administrative costs have to come from that allocated for educational purposes, so we all lose; those that have paid up their memberships as well as the delinquents. Members who know of someone who has not sent in his dues, encourage him to write a check today.

The 1956 issue of the NAPRE Operating Data Book should be in every member's possession. Anyone who has not received his copy should get in touch with his Chapter Sergeant-at-Arms as he is responsible for its delivery.

Recalls 1928 Detroit Meeting

It's not too early to plan for the convention in Detroit, October 29th through November 2, 1956. The educational program is in the completion stage. It will cover the Refrigeration Industry as a whole. The convention committees are working hard to make this one bigger and better than the two that have been held there previously. Your President had the pleasure of attending the first one in 1928 with over 600 in attendance. The refrigerating industry has come a long way since that time and will continue to progress as we venture into the future.

Conventions are not entirely all educational and social activities. There is much Association work to be done.

For example, in these columns last month was announced the appointment of the Nominating Committee. It was also indicated that a By-Laws Committee would be appointed shortly. A great portion of the work of these two committees can be fairly well resolved by convention time.

Chapters are encouraged to send the Nominating Committee your chapter recommendations for various National offices. Members-at-large are also encouraged to contact the Committee with their recommendations. Over the years the Association has shown by its actions that it believes in the promotion system. You are asked to look over the Officers and Committeemen making up the National roster this term. Then let the Nominating Committee know which merit promotion in the coming 1957 term.

Many chapters have taken the President at his word regarding changes in By-laws. Chicago, for example, has presented two resolutions requiring amendments to the Association By-laws, both of which involve membership classifications. Memphis has presented an inquiry regarding an interpretation of the By-laws.

Functions of Advisory Board

Other resolutions presented by some of the chapters do not involve amendments to the By-laws or their interpretation. Some of these resolutions shall be considered by NAPRE's Board of Advisors. Chicago, again, for example, objects to the new membership card being used by the National Office.

The National Office originated this membership card system in 1956 in order to save valuable time and considerable administrative expense. However, a number of chapter Secretaries objected that the new cards pass some of the National Office's burdens to them. Our National Board of Advisors consisting of Past Presidents of the Association, all experienced men who have been through many National offices, will consider this, as according to our By-laws, all such disputes are referred to them. Chapters which have any other complaints should make them known to the President or the Secretary.

Still other Association chapters have petitioned for air conditioning and advanced refrigerating courses, and even some electrical texts for use by individuals or in chapter instruction. Matters of this nature, of course, have to be considered by our Board of Directors, as they involve funds. The Board will have to consider such subjects in the light of funds available, cost of program, and the most important aspect of benefit to the over-all membership.

Such matters are considered by the Board of Directors after referring them to the Educational Committee or other appropriate standing committee which digs up all the facts for the Board's use. All resolutions, requests, inquiries, etc., as a rule involve some Committee work. The chapters are therefore urged to present their problems or their suggestions as early as possible.

Chapter Reporting Award

Tacoma, in the opinion of the Chapter Reports Committee, had the best report for publication in this, the July issue. They are to be complimented on the accurate and verbatim reporting, principally. The second factor of merit in their report was the presentation of facts from various speakers' addresses.

It was a close race, however. A few more chapters should be complimented for their participation. Not all the chapters can be cited for their reportorial accomplishments, but for their submission of reports covering the over-all activities of their group. Detroit, for example, is to be complimented for taking advantage of a public press situation. They used it to advantage in signing up new members. Detroit also keeps right after the National Membership Committee and this column for recognition in the Dairy Industry Drive. During the past month they signed up two more members, and made sure that information was included.

Miami has an item of unusual interest to report and challenged Los Angeles to their expandable city limits title. Tampa also sends in reports regularly, although they sometimes overlook the usual form. Their educational activities are manifold. Memphis might be considered runner-up for its report on the classification of defrosting systems. Those facts should be extremely informative and educational to the new members. These monthly chapter reports are worth while reading.

L. Etzel

NAPRE

Question Box

The National Educational Committee, NAPRE, answers monthly in this column, operating problems forwarded by members. The Committee appreciates answers from the field. Address questions and answers to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif.

Are Manufacturers Compelled To Market Replacement Parts

QUESTION NO. 1114: Is there any Federal Statute or law that compels a manufacturer to maintain replacement parts available for any length of time after a piece of equipment is placed on the market?—D.Z., Chicago, Ill.

ANSWER: A number of Federal offices at the U.S. Department of Commerce and the Machinery and Allied Products Association, have taken up the question which you raise. All seem to feel that there is no law regarding the length of time that replacement parts must be kept available.

ARI's attorney states that as far as a Federal law is concerned, he has never heard of any, and with respect to the length of time that it is necessary to keep replacement parts, his thought is that it would be necessary to keep those long enough to cover the warranty on the last items sold. In other words, if a product has a warranty for 5 years, parts should be kept available for 5 years after the last one is sold so that the manufacturer would not be subject to suit for breach of warranty. — George E. Mills, Public Relations Director, Air-Conditioning and Refrigeration Institute.

Needs "Therm" Definition For Gas Bill Calculations

QUESTION NO. 1115: In our refrigerated warehouse, we operate a small gas-fired package boiler for heating of the offices in the winter time and for brine heating for defrosting purposes. In the summertime a little gas heater is used for brine heating.

Since taking over as chief, I find that my gas consumption is reasonably constant, considering weather fluctuations, etc. However, factors used in computing the charges, as indicated on the gas bill, vary from month to month. I do not understand the reason for this variation. Perhaps one of our readers could explain it, as the representative they sent down here from the Gas Company does not seem to be able to clear it up for me.

On one month's bill they show therms per 100 cubic feet as 1.020; and the next month they show this figure as 1.026. In the first month's bill they show "a purchased gas adjustment of 49/100 of a cent per therm"; and the following month this figure as 57/100. What do these terms mean and how are they used to compute our charges? —F.L.B., Oak Park, Ill.

ANSWER: Your consumption is measured in cu. ft. and converted to therms for billing purposes. This is a more exacting method of collecting for the true "heating value" because of the variation of the Btu content of the gas.

Heating value is expressed in Btus and the heating value of natural gas, in general, is between 900 to 1,200 Btu per cu. ft. and usually approximates 1,000.

A therm is a unit of heating value equivalent to 100,000 Btus. The number of therms in a given volume of gas is determined by multiplying the given number of cu. ft. of gas by the average heating value of the gas in Btu per cu. ft. and dividing this product by 100,000. For instance, 100 cu. ft. of gas having a heating value of 1,020 Btu per cu. ft. is equivalent to 1.020 therms. The variations in the number of therms per 100 cu. ft. of gas results from variations in the Btu content of the gas.

The "purchased gas adjustment" means exactly what it says except a rather complicated method of arriving at the adjustment is used. The gas company's basic rates are based on their buying gas from a pipeline company at a certain price. Then a clause is added which permits them to pass on to their customers any increase in rates that might be levied against them by the pipeline company. In other words, the gas the utility purchases from the pipeline company costs them 49/100 and 57/100 of a cent per therm more for the months mentioned than their original basic rates provided. Consequently, the "purchased gas adjustment" clause permits them to pass this on to their customers. —Rateonics Corp., Dallas 21, Texas.

Absorption Refrigeration By Solar Heat Conversion

QUESTION NO. 1116: Could you use solar heat to produce power and energy to run an absorption system?—M.H.S., Tampa, Fla.

ANSWER: The basic cycle of an absorption refrigeration system contains four basic components. These are the evaporator, condenser, generator and absorber. The first two named serve the same function as they do in a regular vapor compression system. The latter two serve essentially as a substitute for the compression system. The latter two serve essentially as a substitute for the compressor. In the compression system, the compressor raises the pressure of the refrigerant vapor from low to high side pressure and requires power input to do so. In the absorption system, the absorber and generator act to accomplish the same effect as the generator requires the addition of heat energy.

Solar energy could be used as the source of required heat energy for the generator although steam and gas are the traditional mediums used. The use of solar energy would involve a number of problems which would have to be carefully studied before you could proceed to a practical application.

Most absorption systems use an electro-driven pump to circulate the liquid. The power necessary to drive this pump could also be obtained from solar energy but it would be a complicated process.—H. P. Hayes.

Seeks Construction Data On Lobster Tank Refrigeration

QUESTION NO. 1117: How can I obtain information on building a lobster tank? The tank is made from plexiglass with no insulation — 6 ft. x 3 ft. x 15 in. high, using 100 to 125 gals. of sea water which is changed once a week. Data on the following would be appreciated:

(1) The sige of pump — gals. per min.

(2) Kind of refrigeration coils

(3) Heat load

—O.H.N., New Haven, Conn.

ANSWER: Information on lobster preservation in a live state after catch, is practically non-existant. Therefore, data on lobster tank construction is even more difficult to locate. However, here are a few items from my experience:

(1) Size the pump for 4 to 5 gpm. Do not put too much water directly into the tank. Keep water inlet about a foot above the tank to aeriate it as it falls or bubbles into the plexi-glass vessel. (This is recirculated water handled by the pump.)

(2) Refrigeration coils should be steel. No copper brass, or other material should be used as experience shows that lobster legs will fall off when the copper gets into solution in the sea water.

(3) Heat load can be figured in much the same manner as with any other uninsulated vessel. However, 2 Btu/Sq. Ft. tank surface/degree F Temp. diff. will have to be used for the plexiglass heat transfer Coefficient. This is for still air. If tank is located in a drafty place, use a multiplier of 2 or 3 times that figure.

With regard to water temperature, no two lobster men seem to be in agreement. Nor do they agree on quantity of water. Practice seems to be hold to the sea water at 48 to 50 F. It is recommended that a water storage tank be utilized with overflow to it, and circulating pump suction taken from it.—CHAS. C. E. HARRIS, Arlington, Mass.

Creating Energy

QUESTION NO. 1118: Can energy now be created?—M.F., Denver, Colo.

ANSWER: Most scientists used to cite the law that energy can neither be created nor destroyed. However, with the advent of atomic energy, it is now realized that matter can be converted to energy and energy to matter. The atomic bomb is a good illustration of this in which fissionable matter is converted to heat energy. In a sense, this can be said to be a creation of energy. However, I know of no experimentation resulting in a pure creation of energy.—H. P. Hayes.

New Questions

Wants Cascade Differences From Compound Explained

QUESTION NO. 1119: I have seen the terms compound system and cascade system used in connection with low temperature refrigeration. What do these terms mean and what is the difference between them?—E. J. G., Seattle, Wash.

Asks Servo-unit Explanation

QUESTION NO. 1120: What is a servo-mechanism? How does one differ from an ordinary type of control? —H.G.T., Tulsa, Okla.

Can Use of Solids' Analysis Pinpoint System Troubles?

QUESTION NO. 1121: Is there any way of identifying solids filtered out of a refrigeration system? In other words, can I trace out my trouble and correct it using the solids as a clue?—M.F.F., Sacramento, Calif.

Why Do Refrigerants Differ In Their Flammable Hazard

QUESTION NO. 1122: I know that refrigerants can be ranked in terms of their explosion hazards and flammability but I am curious as to why some will burn or explode and others will not. Can you explain this in terms of any simple rule of thumb? —E.H.G., Green Bay, Wisc.

Air Refrigerant Qualities

QUESTION NO. 1123: If air makes a poor refrigerant to use in stationary plants why is it used in airplane refrigeration systems?—W.T. M., Sioux City, Ia.

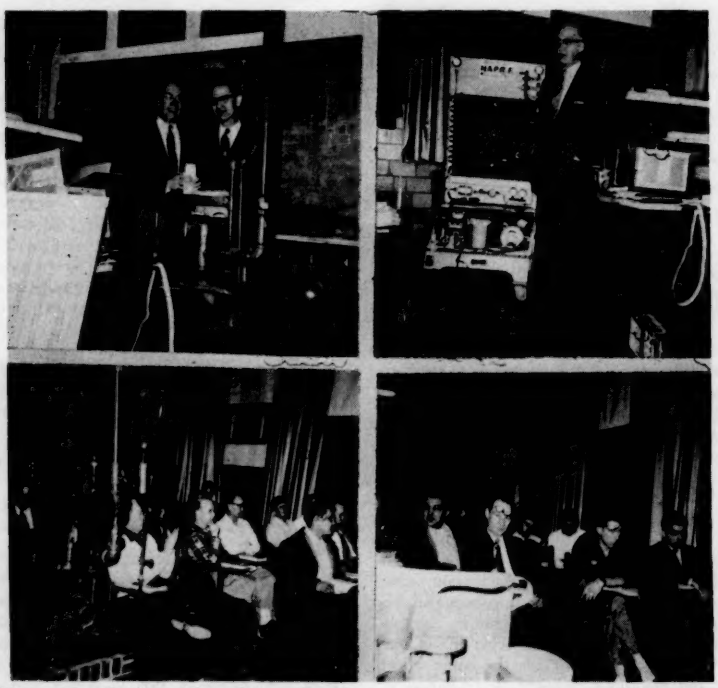
News Notes and Chapter Activities

(Continued from page 43)

GM Tech-Center Engineers Signed By Detroit Chapter

Detroit—Much newspaper publicity was given to the formal opening of the General Motors Technical Research Center at Detroit on May 16. Detroit Chapter showed their customary initiative by promptly enrolling four of the Center's refrigeration engineers as members of NAPRE. The new members are Charles H. Bankert, Robert E. Cover, George H. Durie, Clayton A. Mote.

This foursome is from Warren, Michigan — a suburb of Detroit — well, Warren has just been incorporated into a little city. This is another one of those "Biggest Things in the World" found in the Detroit area. It is tremendous in size, having something like 25 buildings. It is reported that all the G.M. research will be centered there. . .even for refrigeration pertaining to the Frigidaire Division.



Views of a Friday night refrigeration class conducted by the Detroit Chapter. J. K. Rawsthorne, instructor, is pictured in one photograph opposite the model refrigerating system contributed and constructed by members of the class. The unit is placed on rubber-tired casters for mobility. In another photograph, Rawsthorne is pictured with Boyd Kitts, Detroit Chapter's other instructor. This team has proven to be a successful combination in putting across Basic Refrigeration.

Detroit, as Convention Host, has scheduled a tour of the Research Center on Wednesday afternoon, October 31, 1956!

The chapter is sorely grieved at the loss of its charter member and national honorary member, George B. Bright, Sr., who passed away on June 2.

The chapter has continued its practice of conducting refrigeration classes each Friday. J. K. Rawsthorne and Boyd Kitts alternate as instructors. Although the trade school where the classes are held has some equipment, the members themselves have contributed more parts and equipment and actually constructed a model compression refrigerating system which can be used for demonstration purposes in the classroom work.—L. L. ADAMS.

Denver Reviews Refrigerants

Denver—Denver Chapter's President, Mike Bistranih who doubles as the chapter instructor many times, capably and thoroughly covered the 3rd chapter of Basic Refrigeration. This chapter deals with refrigerants. As usual, members participated and the chapter had some good practical discussions on the topic. Mike's wide experience in service and erection as a York engineer makes him an excellent teacher because he has the technical as well as the practical answers.

It has been suggested that in addition to the reference material listed in the Instructor's Manual on Chapter 3, that members review two papers which appeared in Industrial Refrigeration in the April and May issues of 1955. The subjects of these papers are "The Characteristics and Applications of Refrigerants Old and New" by Guy R. King, and "Selecting and Using "Freon" Refrigerants" by W. R. Barnard. Several members commented on the fact that these two papers were perhaps the most modern references available in connection with Chapter 3 of BASIC REFRIGERATION.

At this same May 15 meeting the members present chose an educational committee consisting of Al Nazerenus, our vice-president as chairman; J. Bruce Espy was selected as the technical advisor and Mike Bistranin as instructor. The chapter voted to carry the class instructions sessions on through June, but vacation for July and August.

Our first meeting in the Fall will be a tour of Coors' Brewery on September 11. The treasurer reported at this meeting, his report indicating a healthy balance for a new chapter and all bills paid.

Following the instruction period at our meeting on May 25, the members enjoyed two diversionary films. They were Socony Mobile 1955 — 500 mile race pictures and one entitled "Cool Hot Rods." The timing for these films was just right, preceding the big Indianapolis Race on Memorial Day. There was some discussion of a catalog of free films and the members suggested that samples of the catalog be forwarded to the National Educational Committee.—MARCUS FLORIDA.

Automatic Plants and Vacuum Cooling Double Header Program at Los Angeles

Los Angeles—Once again an unscheduled event on Los Angeles Chapter's meeting agenda threatened to steal the show on the night of May 16 at the Terminal Club. A demonstration of a model Gay-Vac vacuum cooler by engineers of the Gay Engineering Co., Los Angeles, cut deeply into the period allotted to the programmed speaker, but the "overtime" period later on compensated for the "extra."

Chester Anderson and Al Howell of the Gay Engineering Company's technical staff had brought a vacuum cooler to the meeting hall to have photographs of it taken at the request of NAPRE Secretary Dick Kelahan. But the instrument proved to be so intriguing, and Anderson and Howell were so agreeably obliging in describing it construction, that more than an hour elapsed before Chapter President Clifford P. Scott could get the scheduled educational program under way. Groups of NAPRE members and guests were still clustered about the unit at 9:30 p.m. when the session ordinarily should have been over. A demonstration of the Gay-Vac had been given before members of California Chapter No. 1, San Francisco, previously.

Los Angeles NAPRE Chapter members at their May 16 meeting heard Robert McKee (standing-left), mechanical engineer with Pacific Fruit Express Co., San Francisco, present his convention paper on "Automatic Ice Plants," amplified with comment on latest developments. The machine behind McKee is a Gay-Vac vacuum cooler which was demonstrated at the meeting by technicians of Gay Engineering Co. Chapter program chairmen should be quick to note the "Question Box" prominently displayed and well used at Los Angeles.

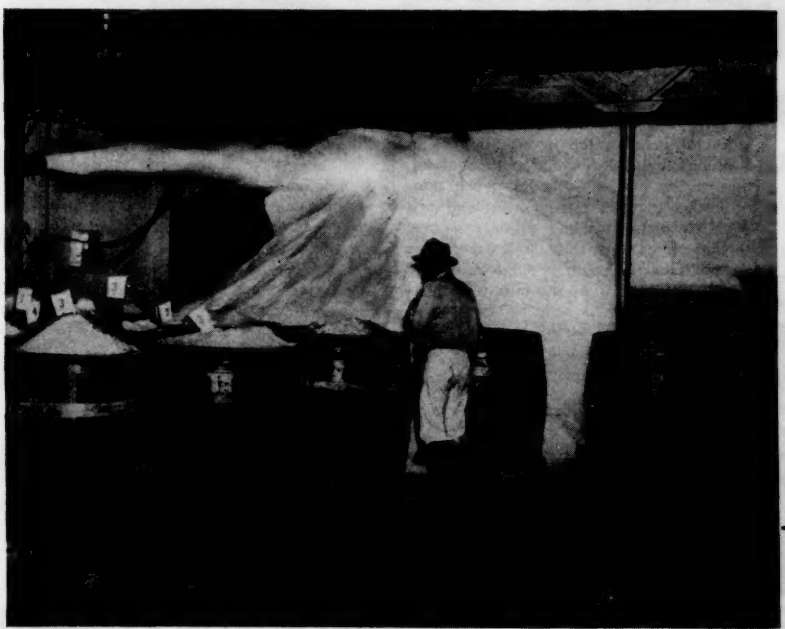
The promise of a talk by Robert McKee of San Francisco, mechanical engineer for Pacific Fruit Express, on the same subject which won him wide acclaim at the 1955 NAPRE convention in Los Angeles, attracted more than the usual number of members to the meeting. McKee's paper on "Automatic Ice Plants" included all the points he had covered at the convention, plus some added material on developments that have occurred in automatic ice plant design and operation since last November. A lively discussion in the form of a question-and-answer period developed after the close of McKee's presentation.

Guy King directed the preliminary class. He discussed the American Standard "Safety Code for Mechanical Refrigeration" (the so-called "B-9" Code) sponsored by ASRE. He explained in his introductory remarks that while the code is not officially effective in Los Angeles, it ties in with the California State code in respect to its major provisions.

King presented charts listing the minimum permissible amounts of refrigeration in different occupancies—institutional, public assembly, residential and commercial—and gave a thumbnail definition of each occupancy class in the four already mentioned, plus the industrial and mixed occupancy classification. He discussed minimum refrigeration permissible in halls and lobbies of various types of

Improve service--sell more ice

with a high-capacity, low-cost LINK-BELT Ice Crusher-Slinger



BARRELS OF POULTRY are kept fresh while awaiting shipment in warehouse. Slowly melting ice produced in quantity by Crusher-Slinger assures correct temperature and moisture.

SHIPPERS, warehousemen, wholesalers of perishables offer you a source of profit for top-icing service. They must ice perishables to protect salability—en route or in storage. And there's no better way to get into this market than with a low-cost, high-capacity Link-Belt Ice Crusher-Slinger.

You have a choice of either portable or stationary types with gasoline engines or electric motors—capacities from 15 to 60 tons per hour. Ice particles are delivered uniformly to all corners and crevices for maximum protection. For complete information on Ice Crusher-Slingers see your nearest Link-Belt office. Or write for Book 2382.

14,130

LINK-BELT

ICE CRUSHER-SLINGERS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

buildings, and in kitchens, laboratories, machinery rooms and other spaces.

King broke down the discussion on refrigerant classifications to consideration of Group 1 refrigerants (carbon dioxide, all fluorinated hydrocarbons); Group 2 refrigerants, which are toxic or inflammable, including ammonia, dichloroethylene, ethyl chloride, methyl chloride, methyl formate, and sulphur dioxide; and Group 3 refrigerants, which are explosively inflammable, including butane, ethane, ethylene, isobutane and propane.

Chapter Directory Circulated

The 1956 edition of Los Angeles Chapter's program and membership index has been completed and distributed to the membership. Emmet T. Quinn and his committee have published a 63-page pocket-size booklet that contains complete membership rosters of Los Angeles and Colton, Calif. chapters. The Los Angeles information section contains a complete list of current officers and committee personnel, the educational program for every 1956 meeting, and a listing of chapter presidents from the founding year, 1922 to 1955. The directory carries the name, address, firm name, business and home telephone number of 367 Los Angeles and 30 Colton chapter members.

The May 2 meeting was featured by a talk on "Automobile Air Conditioning" by Newton Small of Climatic Air Co., Tyler, Texas. He discussed design of units and methods of refrigerant control for summer and winter operations, and presented other pertient information on package units.

On April 18 the chapter was privileged to hear Vernon W. Sharpe of Sharpe Engineering Co., formerly chief engineer of Propellaire Inc., and Dynamic Air & Engineering Co. His subject was "Selection and Maintenance of Fans & Blowers". He supplemented the talk with a 16 mm colored movie. His discussion dealt with the characteristics, design and applications of centrifugal and axial flow equipment. Forward as well as backward curved blades were analyzed by the speaker, and the advantage of each type for specific air propelling purpose was cited. Mr. Sharpe also discussed some methods of making field capacity and velocity tests on various types of blowers.—FRED HERR.

Electric Compressor Drives, Official Visitor For Northwest

Tacoma—April 6 was a big day for the Northwest Chapters, especially Tacoma. Our National Secretary, Dick Kelahan, paid us a visit on his way to the N.A.R.W.—T.R.R.F. Convention in Los Angeles. A meeting was held in the Presidential Room of the Winthrop Hotel as a get-together of the Northwest Chapters to meet and hear Mr. Kelahan address us on national projects, future N.A.P.R.E. educational plans and general information on a national level. We were sorry that the delegation from Yakima was unable to make it. Delegations from Seattle and Olympia turned out in force.

In his talk Mr. Kelahan gave a number of eye-opening facts. The membership of N.A.P.R.E. has doubled in the last three years with a membership of over 2500. The number of chapters has gone from 12 to 30 in six years. It has been a phenomenal growth, indicating a new desire and need for more technical knowledge in the science of refrigeration. He said the National Organization has had practically no new ideas in education to present in the last six years but has several coming along now, such as Professor Hayes' negotiations for a book on air conditioning.

He said new ideas come from the members themselves and can be presented to the National Organization either through the Secretary or delegates to the National Conventions. The idea for the pamphlet on synchronous motors was cited as an example. It was originated by John Grainger, Secretary of the Seattle Chapter.

Our Industry relations will be better, both educationally and financially, with the new industrial memberships, and each chapter should have an industrial relations committee to more closely integrate N.A.P.R.E. activities and aims with allied local industry.

As to finances, the organization is on a firmer financial foundation than at any time in its history, although much more is needed to extend the educational program. Income from the primary sources — dues, Operating Data book advertising and National Convention exhibits — will be aided materially by the industrial memberships which will number at least 40 by October 1st. These industrial memberships will cost $400 per year for which they will receive $150 worth of advertising in the Operating Data book, the $150 fee for exhibits at the National Convention and a $100 contribution to the Veneman Educational Fund.

All chapters should make an effort to obtain advertising from local firms especially as a means of supplementing chapter funds since 15 percent of local advertising money goes to the local chapter.

Mr. Kelahan gave a brief talk on the effort and enthusiasm the Detroit Chapter is giving to the 1956 convention which will be held October 29th through November 2nd. They have so far arranged a field trip through the American Blower Company, a lecture on the manufacture of coded pressure vessels and a lecture from the Detroit Edison Company on the new atomic power plant under construction.

He planted the seed for the Northwest Regional Chapters to work for a National Convention in this area in a few years by proposing a regional educational clinic next season as a test of how we could organize and run a convention. Well, the seed has been planted—and the Northwest intends to cultivate it.

A pleasant interim of entertainment was provided by a group of young people from the Hawaiian Conservatory of Music with some cut hula music and dancing, thanks to Glen Gray who arranged for it.

Our regular meeting for April 4th was overshadowed a bit by the visit of Dick Kelahan the same week, but we had a very interesting session capped by a lecture on alternating current motors from John Spotts, Electrical Engineer for the Hooker Electrochemical Co.

After a short business meeting in which we welcomed Bill Palmer, chief engineer of Medosweet Dairies to our chapter, Wayne Vanderflute conducted the King course, Chapter 12, on Compressor Drives. It was in conjunction with this section on motors that Mr. Spotts gave his talk. He gave a very clear explanation of how alternating current was generated, and did a diagram on the blackboard showing by sine waves the difference between single and three phase current.

Particularly interesting was the explanation of how an inductive load such as an induction motor, caused the current to lag behind the voltage, giving a poor power factor. He indicated how capacitors

Left: NAPRE's National Secretary addresses a joint meeting of Olympia, Seattle and Tacoma Chapters at Tacoma in April. Flanking Secretary Kelahan are Phil Gilmore, Tacoma Secretary, left and Archie Waterbury, Tacoma President. Center: Entertainment "between halves" at the Northwest meeting, featured a Hawaiian troupe. Right: Chapter officers and past national officers in attendance at the Northwest Chapter Conference.

or Synchronous motors cause a leading current which will bring the power factor back. He said the trend in industry is to splash proof or totally enclosed motors, rather than open motors, even though the latter may be cheaper in first cost. The enclosed motor will run at a higher temperature than the open motor, and thus have a slightly shorter life, both having the same type class A insulation. But the freedom from moisture damage, dirt and oil in the windings, does favor the enclosed motor.

In selecting heater protection for enclosed motors it should be kept in mind that the manufacturers tables for 40 degree Centrigrade rise motors are figured with a 15 percent service factor overload. So in selecting heaters for 50 or 55 degree C. rise motors, this service factor should be taken into consideration by choosing the next size smaller heaters for the same rated amperage. The ambient temperature where the motor is located in relation to where the starting relay and heaters are located should also be taken into consideration. For example, a motor located in a warm position near a boiler and its overload protection in a kitchen hallway would require a smaller size heater than if both were in the same ambient temperature. Ambient temperature is always measured from the air entering the motor.

A color film on the prefabricating of weld pipe and fittings was shown. It was made by the Grinell Pipe Company, and showed all the processes used to prefabricate pipe for particular construction jobs. Of special interest is the way tees and small diameter connections are extruded on large diameter pipe, by pulling successively larger steel balls up through a hold in the heated section of pipe, to form a perfectly rounded low friction connection.—PHIL GILMORE

Tampa Discusses Codes

Tampa—A refrigeration code for the Tampa area was the topic of a short discussion by the chapter at the meeting on April 26th. The matter was referred to a special committee. Their instructions were to contact the A.S.R.E. section and the Florida Engineering Society to see if these organizations were interested in taking any action on a proposed refrigeration code.

The educational meeting was held prior to the business meeting, at which time the instructor, Robert L. Rhodes, constructed a psychrometric chart on the blackboard. The instructor worked out a number of problems, among which were two having different temperatures and different humidities, but with the same enthalpy, assuming that the air to be cooled passed over the evaporative surface. Another problem presented by the members involved the use of a water cooled condensor in conjunction with a cooling tower. Members participated in the solution of this problem.

Vice President Joe Bustelo handed out psychrometric charts to each member in order that they could follow Rhodes with the examples. The charts were furnished by the Southern Equipment Co. Members also requested the educational committee to obtain psychrometric charts from General Electric, and to contact Alco Valve Company for some steam tables. The meeting was brought to a close with the usual coffee and doughnuts, those members preferring milk enjoying that beverage through the courtesy of Borden Company.—MARTIN SMITH

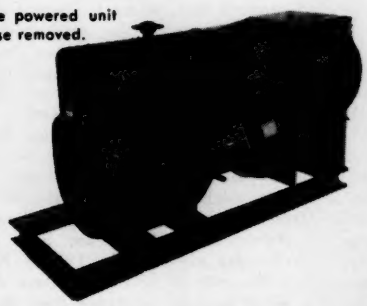
"Genetron" Film Shown

Tampa continued to hold weekly meetings through the month of May, with a featured speaker, educational film or discussion on the refrigeration course occupying the activities of the members at each meeting. A film dealing with Moisture in Refrigeration was shown by E. V. Dunbar, representative of the General Chemical Division, Allied Dye & Chemical Corporation, manufacturers of "Genetron" refrigerants. Mr. Dunbar handled the discussion period following the film presentation and distributed literature containing technical data and properties of their fluorinated hydro-carbon refrigerants.

Other films shown during the month by the educational committee were, one on the rewinding of 3-phase motors; another on the adjustment of refrigerant controls; one on General Motor's diesel engines and on the compression ignition of diesel engines. Manufacturers and other associations have been very cooperative with the chapter in providing bulletins and catalogs. Among these were General Elec-

Electrically powered unit with flexible hose.

Gasoline powered unit with hose removed.



Scorer Breaker-Elevator Conveyor Breaker

all new

G-W ICE CRUSHER-BLOWER

Snowballs Icing Profits

Here it is—the new Gifford-Wood Ice Crusher-Blower that can boost your icing service sales—*fast!* Now you can give better service—the kind of top-ice service that means repeat business. Shipments of perishables are pampered all the way to their destination with an even, protective cover of G-W crushed ice that penetrates to the farthest corners of trucks and railroad cars.

Choice of electric or gasoline powered motors with both portable or stationary models means you can build ice profits anywhere! What's more—this new G-W Crusher is surprisingly inexpensive...pays for itself in no time. Write G-W today for *all* the facts. ® 1956

GIFFORD-WOOD CO.

Since 1814
Hudson, N. Y.

New York 17, 420 Lexington Avenue
St. Louis 1, Railway Exchange Bldg.
Chicago 6, 565 W. Washington St.

Pacific Coast Representative
Western Ice Equipment Company, 420 Market St., San Francisco

tric Company which provided a psychrometric chart SE-00-83; The Frick Company which provided Bulletin No. 211F on Compressors; The Zeolite Water Softening firm which provided engineering data on their equipment, and pamphlets from Refrigeration Service and Contracting magazine, "Oddities in Refrigeration" and "Changing Refrigerants".

It should be noted that all the bulletins, catalogs and films were accompanied by letters offering the Tampa Chapter everything that these firms have, but their personal belongings. Some really went overboard. When asked for 50, they sent 100. There certainly can be no criticism of manufacturers and associations in this area. The catalogs and bulletins have some very fine graphic aids and most of the technical data cannot be found in text books.

At one of the May meetings problems on heat and energy, pumps, engines, and codes from other cities were discussed. One member presented a thought for the future: Heat engineering will be comprised of all branches of engineering except maybe structural and civil. An observer might comment that Tampa's educational program is being conducted with that thought in mind.—MARTIN R. SMITH.

Patents and Food Freezing Speaker Topics at Seattle

Seattle—Patents in the Patent Office in Washington, D.C., was the first topic of a double feature delivered to Washington Chapter No. 1 by Past President, Frank Knowles, on April 19. Frank had recently been through the patent office and was greatly impressed. He reported that the patent office is a building a half mile long and seven stories high filled with all kinds of patents. There are registered approximately about four million patents. All patents are classified as to their particular field. The most interesting thing about the patent office are the models of some of the earlier patents. It was the custom in those days to submit a model of the patent asked for, whereas now a blueprint is submitted.

One of the models that impressed Frank was of an early type steam engine, very much the same as the Cornish pump which was used in the coal mines in Wales. This consisted of an inverted steam cylinder. A steam jet forced steam into the cylinder which forced the piston up. Then a jet of water was forced into the cylinder. The water on coming into contact with the steam caused it to condense and so formed a vacuum pulling the piston down. There were also models of oscillating engines which were at one time common on steamships. Frank said a person could spend days there just seeing some wonderful models of engines that were and would be.

Following the patent discussion Knowles showed a film and gave a running commentary of the early method of processing fresh frozen foods in the field. These were of plants that Frank had manufactured himself and installed. Modern machines may be more efficient but the principle is the same. Following this Frank then turned to a lighter subject and showed two films he had taken on a deer hunt and fishing trip through the lakes and mountains of Washington.

Bob Harrison the Chapter instructor covered the subject of condensers from the Guy R. King course, BASIC REFRIGERATION. This meeting was held in the Central YMCA. Members present voted to change the meeting date from the third Thursday to the fourth Tuesday and Thursday alternately in order that members on the swing shift on Thursdays may attend the meetings. President Howard Penor and Secretary John Grainger both gave a resume of the report made by the National Secretary at Tacoma on April 6.—JOHN GRAINGER.

Mobile and Philadelphia Show Chapter Interest

New Orleans—Inquiry concerning the revival of a chapter in the Quaker City brought a favorable reply from R. G. Hassel, Sales Manager, Henry Bower Chemical Manufacturing Co., Philadelphia, Pa. He wrote the Past Nat'l President, Erich B. Utescher, National Publications Chairman: "Inasmuch as I have been with the company many years, immediately upon receipt of the letter from Frank Chase, Vice President NAPRE, I remembered your friendship for our former representative in Chicago, Gus Kloss, and also of the time and effort you put in the NAPRE Chicago Chapter while you were the engineer at the Drake Hotel.

"I will be happy to try to work with you in forming a Philadelphia Chapter, but unfortunately, this request comes to us at the start of our seasonable business. I doubt whether we could create vary much interest over the Summer months, however, if you are of the opinion that the four members-at-large shown in Mr. Chase's letter can get together for lunch and discuss the possibility of a chapter in Philadelphia, I will endeavor to be with you; in fact, I would be happy to renew my pleasant relations with you."

Another enthusiastic member from the Tennessee No. 1 chapter, who is working with the Vice President in trying to form a new chapter in Mobile, Alabama, is Gordon C. Wiggins, Superintendent, Carloss Well Supply Co., Memphis, Tenn. and Mobile, Ala. NAPRE has a number of members-at-large in the Alabama — Gulf area who could be the nucleus of a chapter.

Correspondence with the following members-at-large in the past month makes mention of them almost mandatory: H. Aveldson, O'Mak, Wash., Chas. N. Ayers, Walla Walla, Wash., Wm. Baker, Panama, Rep. Panama, Larry W. Banta, La Porte, Texas, Carl Behning, Duluth, Minn., Chas. F. Belew, Pt. Clear, Ala., James E. Binning, Richmond, Va., Virgil Breshears, Anchorage, Alaska, Claude Brewer, Long Branch, N. J., W. H. Calahan, Ft. Thomas, Ky., Oliver W. Callaway, Nixon, N. J., Ed. A. Challandes, Marlboro, N.Y., Herman J. Duke, Richmond, Va., John E. Duquette, Bay City, Mich., Clyde Frampton, Akron, Ohio, A. W. George, Sparks, Nev., R. M. Goodfellow, Arkansas City, Kansas, Ervel Lee Green, La Junta, Colo., Wm. Gretz, 3rd, Philadelphia, Pa., Harry F. Griese, Jr., Louisville, Ky., and Wm. H. Gulsby, Columbus, Ga.

Mention should be made also of these members and our hopes to have them at the NAPRE 47th annual convention which will be held at Detroit, Michigan, October 29 through November 2. Some of them are making plans now to attend. E. Judson, Ogden, Utah, Frank L. Kain, York, Pa., Harry R. Katzen, Phila., Pa., Charles F. Kues, Irvington, Va., Geo. W. Large, Beardstown, Ill., Wm. H. Laverty, Camden, N.J., Wm. Lorenze, Lincoln, Nebr., Allen A. Lawrence, Sitka, Alaska, Roy G. Myers, Falls City, Nebr., Edw. J. Nelson, Pocatello, Idaho, Carl Nessler, Texas City, Texas, Charles M. Noel, Laramie, Wyo., G. M. Omohundro, River Edge, N.J., Roy I. Peterson, Shreveport, La., Will C. Presley, San Jose, Calif., Wm. F. Riley, Geneva, N.Y., W. W. Roberds, Houston, Texas, Wm. P. Sterling, Anchorage, Alaska, Albert Stuart, Orangeville, Ohio, Robert G. Summers, Buffalo, N.Y., Wm. F. Taffyn, Laurel, Md., W. Warren Wilson, Camden, N.J., Robert S. Wood, Belle Glade, Fla., T. V. Woodward, Anadarko, Okla., H. Dale Young, Salem, Oregon.

Others heard from abroad include: J. A. Boell, Jr., Victoria, Australia, Naranjan Singh Chadha, Jullundur, Punjab, India, John J. Dolan, St. John, N.B., Canada, Nathan Feldman, Mt. Carmel, Haifa, Israel, Joseph L. Gichard, Wellington, N.Z., J. O. Mumford, Worthington, Sussex, England, J. Gonzalez Prieto, Playa Ponce, Puerto Rico, Ricardo F. Redlich, Lima, Peru, Marim Rubinstein, Haifa, Israel, Arthur W. Stedman, Frankfurt, Germany, David Trail, Jr., Queensland, Australia.

Miami Annexes Boston

Miami—Greater Dade County Chapter has had rather slow progress in its membership drive but is still in there fighting for recognition in the national contest as will be evidenced from one application turned in recently. Los Angeles will have to expand its city limits again in order to catch up with Miami following this membership feat. New member Walter Molter is from Boston where is employed as Chief Plant Engineer for Boston City Hospital. He spent a few weeks at Greater Dade County Chapter Secretary's hotel where his path and that of the secretary (the hotel engineer) crossed. Results were quite as expected and ended up with an application for membership on the part of Molter. Greater Dade County was pleased to have him as a guest at their meeting and to accept him as a member. We now have hopes that he will establish a Boston chapter in much the same way that Greater Dade County was established in Miami.

Refrigeration classes are held every Wednesday night at the Parkley House, 530 Biscayne Blvd. The members derive a great deal of assistance from the refrigeration course and the chapter has not planned to give up any of its summer meetings thus far. Chief engineer of the Parkley House is our member William Robison.—C. W. MONEYPENNY.

Tulsa Speakers Discuss Oil Separator Applications

Tulsa—Oil separators ranging in size from 6 ton to 225 ton applications, was the main subject of the May 15 meeting of Tulsa Chapter, NAPRE. Educational Chairman John Boyce had engaged R. L. Williams and Bill Polluck at Temprite Products Co. as speakers for the educational program at this meeting. These gentlemen explained where oil separators should be located. To help the lecture, Polluck had some cut-away separators on hand which he demonstrated. These props enabled members to more readily understand how the separators actually worked.

Williams explained why oil separators were more in demand on low temperature work than they are in connection with high temperature systems. Further, the speakers covered refrigeration applications in water and beverage coolers, at the request of several members present.

Tulsa plans two summer parties and suggest that any NAPRE members vacationing in the Tulsa area contact past National President George Koehne, of Tulsa Ice and Cold Storage Company, or Bill J. Swadley of Beatrice Foods Co.

The June 5 meeting consisted of a field trip through Sinclair Oil Company office building. NAPRE member Melvin Coffey, the chapter's former secretary, is the engineer in the building.—BILL SWADLEY.

Engine Room Practices Green Bay Speaker Topic

Green Bay—Featured speaker, NAPRE's Vice President, Bert C. McKenna, was unable to attend at the Green Bay Chapter meeting of NAPRE on May 16 as scheduled. National Secretary Dick Kelahan substituted for McKenna. McKenna's presentation "Engine Room Practices and Procedures", which he had delivered in January at the Management Training Conference for NARW, was the paper that Kelahan read. Although the National Secretary expressed the regret of the Vice President of not being able to appear, the members found the talk very instructive and informative and indicated their appreciation of a few side lights that the substitute speaker brought in on the topic.

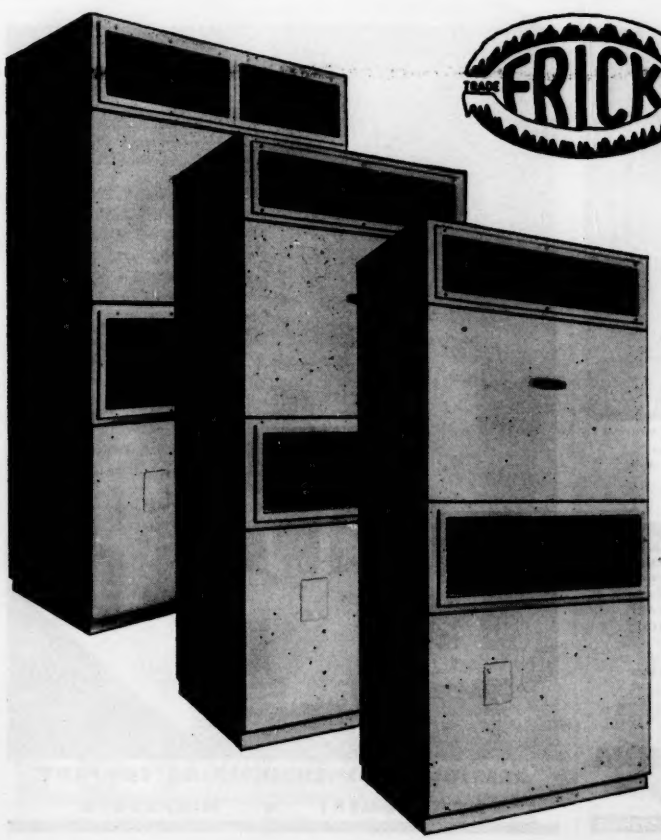
According to McKenna, the heart of the refrigerated enterprise is the Engine Room and its personnel. Other departments like top management, warehouse supervision, accounting, traffic, etc. are the mind, arms and legs of the warehouse operation. Personnel, their safety, operation and maintenance practices are four factors most important to healthy well regulated Engine Room operation. Procedures followed in executing these practices contribute to the economic well-being of the enterprise.

Unseasonal shut-downs due to lack of maintenance, according to McKenna, detract from economic health of refrigerating industry the same as in any other business. Active and accurate machinery history and maintenance records assure the most reasonable preventive measures. Operation efficiency is not only dependent on simplified and useful logs, reviewed periodically, but also on unique practices brought about by local conditions, such as scheduled shutdowns due to curtailed power periods.

His talk also covered the topic of Safety as another contributing factor in operating maintenance and efficiency. Personnel relations within the Engine Room family and with other department relatives, contribute to continued safety, efficiency and overall welfare of our refrigerated enterprise, in the opinion of the speaker.

Milwaukee Guest

Another guest at the chapter meeting was Pat Kelly, president of the Milwaukee Chapter. The purpose of Kelly's visit to our chapter was to invite Green Bay's participation in a regional conference being planned for Milwaukee in the Spring of 1957. Mr. Kelly presented a skeleton proposal of the educational objectives of such a conference. It was patterned after the conference held in Chicago in 1955, except that the emphasis would be on air conditioning of public buildings and institutions. Although the chapter took no action at this meeting, the chapter presi-



FRICK

Unit Air Conditioners

Have built into them 50 years' experience in conditioning air, 74 years' experience in refrigeration, and 103 years of successful engineering. Frick unit air conditioners installed in 1938 are still in service—and good for a long time to come.

These superior units are furnished in sizes of 3, 5 and 7½ hp. They have heavier (quieter) cabinets, well insulated; larger cooling surfaces; insulated condensers; conservative ratings; and many other advantages. All are shown in Bulletin 522. Your copy is waiting: write today.

Some desirable territories still open for qualified Distributors.

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO PENNA U.S.A.

dent, Amos Vierbicher assured Milwaukee president Kelly that their chapter would have the cooperation of Green Bay.

Chapter past president Lester Winkler renewed an invitation tendered to the chapter to attend an open house hold at his plant, the Oshkosh Brewing Company, on May 26. Winkler, who is also a member of the National Publications Committee, NAPRE, called attention to an advertisement by a refrigerant manufacturer which was appearing in current issue of our official organ. He brought out the fact that the valve pictured in this advertisement would be an excellent discussion subject. Discussion was scheduled for a later meeting. Don Wishart, son of charter member Harvey Wishart, was admitted as a new member of the chapter.

Kelahan, in his capacity as National Secretary, also commented on the conduct of the Refrigeration Course within the chapter. He answered several questions from the floor and explained the purpose of the withdrawal card as issued by the association. Several members at Green Bay who have been forced to leave the chapter due to exployment elsewhere in other fields, or for reasons of health, had not been aware of the fact that a withdrawal card was available. The National Secretary pointed out that the withdrawal card benefitted the member in that no reinstatement fee was required when a member was re-admitted. Otherwise a member is liable for his dues until he resigns or withdraws.—J. B. SCHOUTEN.

Motors and Their Controls For Refrigeration Industry

San Francisco—Latest designs and types of motors and controls available for driving refrigeration equipment, application of automatic controls to motors large and small, servicing requirements of motor drives, was the topic of Harold Wells, Electric Machinery Manufacturing Co., at the April meeting of California Chapter No. 1, San Francisco. Wells' talk covered the problems that confront both design and operating engineers and was followed by a Question and Answer Session. Pamphlets issued on the subject were distributed.

At the March meeting Lewis Brooks, Carrier Corporation, and former secretary of the chapter, had as his topic "Cooling with Steam". As the principal speaker of the evening, Lewis augmented his talk with slides. He discussed the vapor absorption system such as is being installed in several development areas in the San Francisco suburbs. The purpose of his talk was to acquaint the members with this equipment and its application prior to a field trip that is scheduled for later in the year.

Other topics covered at San Francisco included one on "Atomic Energy for Power Use Today" by Harvey N. Skow of the Westinghouse Corporation; a talk by Dwight Partell of Pittsburgh Corning Corporation. Partell's talk covered the manufacturing processes, uses and applications of "Foamglass". These talks were given at the February and January meetings respectively.—H. GUILMETTE.

Secretary Makes Official Tour of Olympia

PRIOR to the special Northwest meeting of April 6, when the Seattle, Tacoma, and Olympia Chapters had an "official" visitation from Headquarters in the person of Dick Kelahan, the National Secretary, the past and present Olympia Chapter

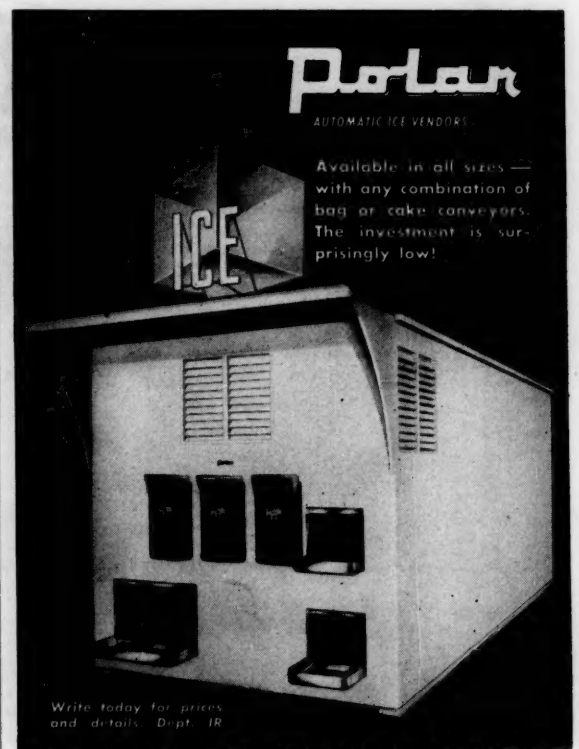
NAPRE Secretary Kelahan on tour of Olympia Brewery with Bert Holmes and John Anderson

ENGINEERED FOR BIG JOBS...
with bigger Profits in mind!

More than 400 plant operators here and abroad have chosen King Systems for more efficient bulk freezing jobs for bigger profits. King Systems give you increased cold-room capacity, faster freezing, engineered distribution of air, continuous operation with no costly defrosting shutdowns, retention of product flavor and quality, lower power costs, a quick-freeze system designed for your specific needs.

Write for technical bulletins. More than 50 years experience is at your disposal.

THE King CO. OF OWATONNA
907 N. CEDAR ST. OWATONNA, MINNESOTA
MANUFACTURERS OF SHARP FREEZE, COOLING, VENTILATING AND HEATING SYSTEMS


Polar
AUTOMATIC ICE VENDORS
Available in all sizes — with any combination of bag or cake conveyors. The investment is surprisingly low!
ICE
Write today for prices and details. Dept. IR

REFRIGERATION ENGINEERING COMPANY
MONTGOMERY • MINNESOTA

officers took him on a tour of Olympia Brewing Co. Scott Olmstead, editor of Olympia's "Its the Water News" caught past president Bert Holmes (left) and president John Anderson, helping with the inspection of a new cellar. Falconer Anderson, Bruce Petrie and Chas. Devine, previous Olympia delegates to NAPRE Conventions, made up the balance of the tour committee. Members from the Seattle Chapter were among the visitors.

Census Bureau Issues Report on Warehousing

THE CENSUS Bureau has published a preliminary report on its study of the public warehousing industry. This report, which is a part of the Census Bureau's over-all Census of Business shows that there are 7,603 public warehouse facilities of all types in the United States. Their 1954 gross revenues amounted to $761,893,000; they employed 94,872 employees and had an annual payroll of $306,627,000. Included in these figures are 585 public refrigerated warehouses operating 349,708,000 net cubic feet of space—NARW Quick Sheet.

Certificate of Cooperation

THE Refrigeration Research Foundation has been awarded a Certificate of Cooperation by the International Cooperation Administration of USA for "significant contribution to the achievement of the purpose of this program by furnishing technical assistance to selected representatives of cooperating countries." The Director, for several years, has met with foreign representatives in the refrigeration industry, in this country and abroad, in order to give them the benefit of The Refrigeration Research Foundation's experience in the research and industrial fields.—TRRF Bulletin.

New Scientific Advisors

TWO additions have been made to the Scientific Advisory Council of The Refrigerated Research Foundation. They are Charles Butler, U.S. Fish and Wildlife Service, Dept. of the Interior, Washington, D.C. and Dr. C. G. North, Beatrice Foods Co., Chicago. Dr. North will strengthen the Council in the field of dairy products research, and Mr. Butler will do likewise in the field of research of fisheries products.

Northwest Ice Convention

THE ANNUAL Convention of the Northwest Association of Ice Industries was held at the Benjamin Franklin Hotel, Seattle, Wash., April 11-13.

The convention program was consolidated into one day, with reports of officers and talks by ice men on some of the more outstanding aspects of the ice business.

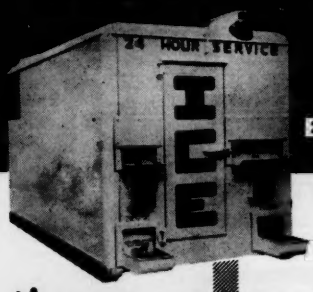
Friday was given over to a conference conducted by C. P. Austin for the National Association of Ice Industries. Mr. Austin gave some very worth while information pointing to the sale of more ice.

Officers were elected as follows: President, W. B. Wilson, Victoria, B. C. Vice-president, Flab Croteau, Spokane, Wash. Secretary-Treasurer, Lu Marsh, Portland, Ore.

Tax Amortization

A CERTIFICATE of necessity for accelerated tax amortization has been granted by the Office of Defense Mobilization to The C & A Terminal Co., Chicago, Ill., for construction of a refrigerated warehouse; amount certified $512,900, percentage allowed 55 percent.

S & S



ICE VENDING EQUIPMENT

NOW AVAILABLE

You can judge S&S by the customers it keeps

5 year Conditional Sales Contracts

Very Small Down Payments

True Lease — Costs You Nothing.

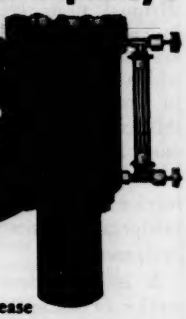
Get full particulars now Contact S & S agent near you

S&S VENDING MACHINE CO.
670 Lincoln Avenue, San Jose, California

Export Division Office: 326 Jackson St., San Francisco, Calif., USA

Need MORE Compressor Capacity?

An ARMSTRONG FOUL GAS PURGER will help you get it!



HERE'S HOW:

AIR and non-condensable gases increase head pressure, and can reduce compressor capacity considerably. Armstrong Purgers *reduce* head pressure by removing all air and non-condensable gases. For every 4 pounds reduction in head pressure capacity is increased 1%.

Here are typical Armstrong Purger results:

- Head pressure decreased 80 lbs. at West Coast packing plant. Compressor capacity increased 20%.
- Head pressure cut 20 lbs. at southern nut and chocolate company. Compressor capacity increased 5%.

Capacity increase is only one advantage of purging with an Armstrong Foul Gas Purger. Learn about the other advantages — send for: *Free Bulletin No. 2211.*

ARMSTRONG MACHINE WORKS

860 Maple Street, Three Rivers, Michigan

Detroit Contractor Contends

Perishable Transportation Applications Are Industrial Refrigeration

LEO C. GAGE

Publicity Chairman
Detroit Convention Committee, NAPRE

MORE mechanical refrigeration units are being applied every day to the high and low temperature refrigeration of perishables. Each month there are announcements in all trade publications and the public press of additional purchases by the railroads of these units for handling low temperature products. In the truck transportation field, mechanical units are being improved and power take-offs from the main power plant are the latest improvements in the mechanical refrigeration of this transportation means.

Even small mechanical units have come indirectly into the marine field through the use of piggy-back services which are being prominently used in the West Coast to Alaska trade.

Charles M. Heemstra, president, Commercial Refrigeration Service Inc., and president of the Michigan Chapter No. 1, NAPRE Detroit, contends that these applications although not very large in size as individual units go, are nevertheless industrial refrigeration because they are used in mass transportation which is recognized as an industry in itself. According to Heemstra, this expanding field will bring about more and more possibilities of practical engineers being called upon to service or trouble shoot mechanical refrigeration units for rail and truck equipment.

It is true, Heemstra admits that service organizations and franchised mechanical unit contractors or dealers in the large cities and metropolitan areas are better equipped and know more about the equipment. Therefore they are the logical people to service, maintain, replace or install new units. However, he points out from his own experience as a franchised service dealer that many engineers operating refrigeration equipment in meat packing houses, cold storage plants, ice stations, breweries and other such installations are quite frequently called upon to check the equipment, to make minor adjustments and sometimes even start or stop the equipment when automatic controls have failed. Therefore he reasons engineers in these plants should have a working knowledge of this equipment in order to respond intelligently to such emergencies.

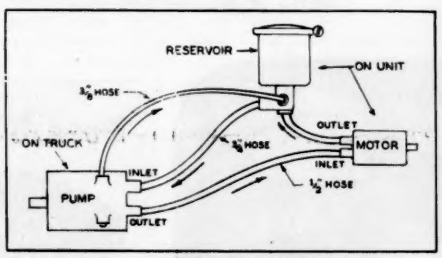
Instructor's Manual Needed

The president of Detroit Chapter contends that NAPRE and other associations should sponsor a composite instructor's manual or course on this equipment. He believes that manufacturers would cooperate willingly in providing material, and that both manufacturers and users would sponsor such instruction courses within practical or service associations or societies. Heemstra intends to sell his ideas to his fellow NAPRE members by offering a field trip through his facilities during the coming NAPRE Convention, October 29 through November 2, 1956.

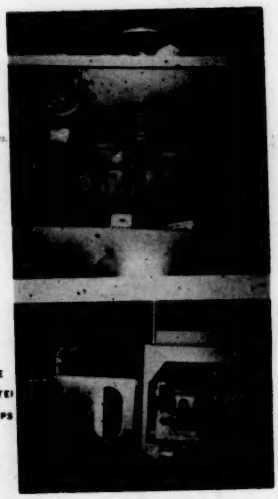
To see what Heemstra has to offer a committee composed of NAPRE national officers and the local convention committee toured Commercial Refrigeration Service Inc.

Chas. M. Heemstra

Heemstra and vice-president, Howard A. McDonough, had in their establishment at the time an ice delivery van, a confectioners and candy maker's delivery truck, two over-the-road semi-trailers used for hauling frozen food to several chain grocers, a beverage and beer distributing truck and a meat purveyor's delivery vehicle. Spotted at a spur across from the service facilities



HYDRAULIC CIRCUIT



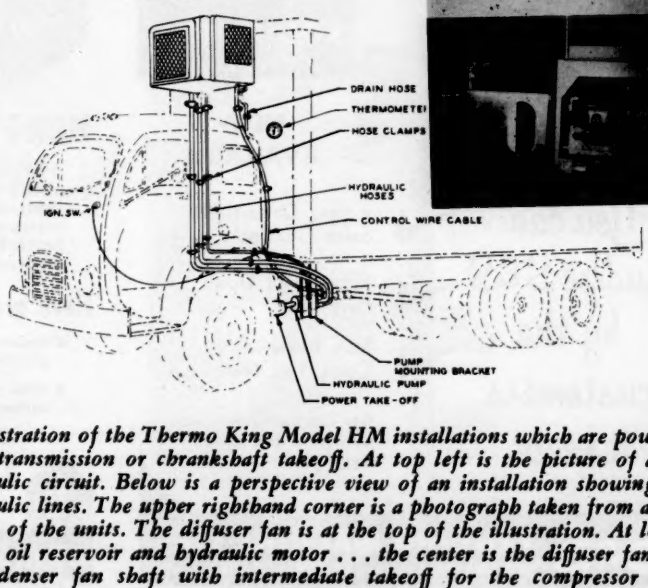


Illustration of the Thermo King Model HM installations which are powered by transmission or chrankshaft takeoff. At top left is the picture of a hydraulic circuit. Below is a perspective view of an installation showing hydraulic lines. The upper righthand corner is a photograph taken from above one of the units. The diffuser fan is at the top of the illustration. At left is the oil reservoir and hydraulic motor . . . the center is the diffuser fan and condenser fan shaft with intermediate takeoff for the compressor unit. Pictured below is a view of the unit with cover raised, prior to installation.

Trucks Use Dry Ice

TWO recent improvements have been introduced for truckers which will aid in transporting perishables such as fruits and vegetables. The new devices use only dry ice for cooling, making the first time dry ice has been used as the sole refrigerant in truck shipments, explained R.F. Allyne, transport refrigeration engineer for Liquid Carbonic Corporation, which is demonstrating the equipment to shippers across the nation.

Heretofore dry ice has been used by truckers only to supplement mechanical refrigeration or as an alternative when other types fail.

"Dry ice is 110 degrees below zero, but the new developments control the temperature and keep the trailer at any reading," Allyne said.

One of the systems, the Clifford, uses a dry ice storage box on the bottom of the trailer plus coils in the roof of the vehicle. The coils have a sealed-in refrigerant and operate much like a household refrigerator, except that the cooling is done by the dry ice.

The other method uses a newly-improved Hunter machine mounted on the front of the trailer with the dry ice stored in the front end. Both methods use only dry ice and give complete temperature regulation.

Meat Packing Geography Changing

GENERALLY speaking, meat packing is moving westward (according to Agriculture & Food Chemistry,) for the following reasons: The growing western population, the savings in transport costs, ability of farmers to truck more of their livestock to market instead of using railroads, and the smaller financial outlay required in Minnesota, Iowa and Nebraska as compared with costs in Chicago. (Wilson & Co., has announced discontinuation of slaughtering in Chicago.) Here are some facts on regions:

Great Plains States: (North Dakota to Texas) have 28 percent of the nation's cattle, 27 percent of the sheep, 12 percent of the hogs.

South Central States are experiencing an increase in cattle and calves that is twice the rate of increase of the country as a whole.

Pacific States are becoming more important in meat packing and local companies are doing most of the business rather than the top ten national packers, and most of the livestock is shipped from outside the region.

Eastern states have the large deficit but sales are increasing and will maintain Chicago's present position in meat packing for a long time to come.—TRRF Information Bulletin.

COMING CONVENTIONS

NATIONAL ASSOCIATION
PRACTICAL REFRIGERATING ENGINEERS, INC.
Oct. 29-Nov.2, 1956
Statler Hotel, Detroit, Mich.
J. R. Kelahan, Secretary

NATIONAL ASSOCIATION OF ICE INDUSTRIES
November 13-16, 1956
Atlanta Biltmore Hotel, Atlanta, Ga.
Guy W. Jacobs, Secretary

NATIONAL POWER SHOW
November 26-30, 1956
New York Coliseum, New York

INTERNATIONAL HEATING AND AIR CONDITIONING EXPOSITION
February 25 - March 1, 1957
International Amphitheatre, Chicago, Ill.

√ ALWAYS UNIFORM
√ ALWAYS DRY
√ GUARANTEED 99.99% AMMONIA

For fast delivery, order from any of the following distributors:

Colorado—Denver—The Chemical Sales Co.
Illinois—Chicago—The Creamery Package Mfg. Co.
Indiana—Indianapolis—Wm. Lynn Chemical Co., Inc.
Iowa—Sioux City—Kennedy & Parsons Co.
Waterloo—The Creamery Package Mfg. Co.
Kansas—Wichita—Barada & Page, Inc.
Kentucky—Louisville—Merchants Chemical Co., Inc.
Louisiana—New Orleans—Barada & Page, Inc.
New Orleans—Whitman-Holloway-Oliver
Michigan—Detroit—Davis Supply Co. of Detroit, Inc.
Flint—Davis Supply Co.
Minnesota—Minneapolis—The Creamery Package Mfg. Co.
Missouri—Kansas City—Barada & Page, Inc.
Kansas City—The Creamery Package Mfg. Co.
St. Louis—Barada & Page, Inc.
Nebraska—Omaha—Kennedy & Parsons Co.
Ohio—Cincinnati—John H. Schafer, Inc.
Oklahoma—Oklahoma City—Barada & Page, Inc.
Tulsa—Barada & Page, Inc.
Tennessee—Memphis—Bessire & Co. Inc.
Nashville—John Bouchard & Sons Co.
Texas—Austin—R. M. Hughes & Co.
Corpus Christi—Barada & Page, Inc.
Dallas—Barada & Page, Inc.
Ft. Worth—Barada & Page, Inc.
Houston—Barada & Page, Inc.
Odessa—Barada & Page, Inc.
San Antonio—R. M. Hughes & Co.
Utah—Salt Lake City—Louis A. Roser Co.
Wisconsin—Milwaukee—Reichel-Korfmann Co.

BARADA & PAGE, INC.

were several mechanically refrigerated railroads cars, one of them actually being serviced at the time.

The refrigeration applications in each instance was a story in itself. For example, the ice truck was used by a local ice manufacturing firm to deliver ice upstate in resort areas. In previous summers this insulated van served the company well with rapid deliveries, but the firm experienced considerable shrinkage in the product in spite of the heavy insulation. Now it is being equipped with a mechanical refrigeration unit to hold temperature at 28 F which should assure a full measure of product for the country or resort dealer. Processed ice in bags or cartons would no longer be melted into a solid chunk. However, the important point which Heemstra made was that this truck was one of a fleet and that the owner expected his ice plant engineers to be able to service the equipment in routine matters. For overhaul or replacement he would expect to return it to Commercial Refrigeration.

Confectioner's Truck

The confectioner was one of Detroit's oldest established candy makers and has a patronage that extends into a three state area. His truck would also be serviced by his refrigeration plant personnel along with several others in his fleet. The same was true of the purveyor, but not so with the brewery distributor. However, Heemstra said that the brewery distributor had also a three state area to cover and at times when making pick-ups at a Detroit brewery had called upon the plant engineer for some advice when the mechanism seemed to be functioning improperly. In this case the plant engineer knew the equipment well, and his advice and instructions to the driver were competent.

Heemstra's partner also pointed out that the semi-trailers servicing chain grocery firms were regular customers for service of the "reefer" units, but many of these drivers experienced emergencies with which they could not cope. When that happened they they resorted to the usual procedure of contacting a cold storage plant engineer or the wholesale grocer warehouse engineer. Only in a portion of these emergencies where they able to get adequate assistance. McDonough was also quick to point out that none of these emergencies arose from poor quality or improperly designed equipment. The equipment is of the best marketed and the service given them was in accordance with a strict routine set-up by the operator or by their own service firm. It is just that the rough service this equipment endures contributes to minor derangements which, if not checked promptly by competent parties, could develop into loss of cargo.

The visting committee were also treated to some of the first installations in the Michigan area of the new truck units marketed by U.S. Thermo Control Co. Commercial Refrigeration Service, Inc., represents this firm and handles their "Thermo King" line. This manufacturer recently introduced a "Hydra-Drive" series for installation in insulated truck bodies. The firm is installing two styles of these units: one, the straight hydraulic drive;and the other a combination hydraulic drive and stand-by electric motor drive. These models are available with manual or automatic defrost system.

Specially designed for truck refrigeration duty, the hydraulic pump may be belt-driven by the engine crankshaft, or may be driven through a power takeoff. The pump is designed to deliver a constant volume of oil to the hydraulic motor, regardless of the speed at which the pump is driven. Consequently, the hydraulic motor speed remains constant, and there is no variation in the refrigeration capacity of the unit. The system uses standard automotive hydraulic transmission fluid.

Temperature control is fully automatic and either hydraulic or electric operation. To operate the unit, the driver snaps a switch that energizes the thermostatic control. The adjustable thermostat is connected to a solenoid. When the temperature in the truck reaches desired level, the hydraulic pump solenoid is energized, and this causes the pump to unload. The flow of oil stops, and the hydraulic motor in the unit stops turning. When refrigeration is again required, the solenoid causes the pump to operate at full capacity.

When connected to power takeoff drive, the hydraulic pump is automatically disengaged when the driver shifts gears.

Door switches are available as accessory items. When the truck door is opened, the switch turns off the unit; and when the door is closed the unit starts again.

According to Heemstra these units are a further incentive to truck operators to replace wet and dry ice installations and are a great improvement over the gasoline engine driven models. With these installations simplified over the gasoline units, he looks for more and more plant engineers to be called upon by their employers to render routine inspection service and minor adjustments. Even if he is not successful in persuading NAPRE's officers to adopt such a course for its members, he feels that other associations interested in the transportation and refrigeration service fields will probably make some effort to come up with the refrigeration instruction manual or course that he prescribes.

Pacific Fruit Express Plans New Ice Plant

THE Pacific Fruit Express Co., jointly owned by Union Pacific and Southern Pacific railroads, announces plans to build an ice manufacturing plant at the Ogden, Utah, Riverdale yard to serve perishable traffic moving east through Ogden. K. V. Plummer, vice president and general manager of the company, said the total cost of the project is estimated at over $1,000,000.

The plant will provide ice for the new 100-car length icing platform constructed in the eastbound yard in 1954. Refrigeration machinery will be fully atuomatic. Facilities will include an ice production building and an administration building. Manufacturing capacity will be 600 tons daily.

Cooling Tower Standards

THE AMERICAN Standards Association has been asked to organize a project to develop American standards for cooling towers. The work requested would cover performance, tests, safety, water analysis, construction requirements, and materials. Three organizations will be invited to serve as co-sponsors: The Cooling Tower Institute, representing the field-erected type of tower; the Air Conditioning and Refrigeration Institute, representing the package or factory-assembled type of tower; and the American Society of Mechanical Engineers. It was suggested that two sub-committees be set up to carry on the technical work —one on field erected towers and the other on factory-assembled towers.

Shrimp From Pakistan

TWENTY thousand pounds of shrimp worth $8,000 were shipped recently to the United States from Pakistan. It was the first commercial shipment from Pakistan for the American market. The shrimp were processed and packed by International Fisheries (Pakistan) Limited, who have plans to export 200 tons of this dollar-earner this year.

Book Reviews

DESIGN OF PIPING SYSTEMS, second edition, prepared by members of the Engineer-Department, M. W. Kellogg Company. Published by John Wiley & Sons. 365 pages double column format, 8½ × 11. Heavy cloth binding. Illustrated. Price $15.00. For sale by Nickerson & Collins Company, Chicago, Ill.

This book covers the entire subject of structural design of piping, with emphasis on the flexibility analysis of critical systems. It includes material to help the designer understand the significance of stresses on piping performance, and several newly developed aproaches that facilitate the general assessment of average piping, or are helpful in the planning stage of critical piping design. Offering an unsually complete treatment of the thermal expansion problem, a method is given for calculating the effects of uniform loading, such as that due to weight or wind.

The treatment of expansion joint systems describes arrangements which were first introduced by The M. W. Kellogg Company for large high temperature lines located in confined areas. A chapter covers various problems of supporting critical piping systems. Another chapter on vibration approaches the subject from the standpoint of the piping designer, with the objective of achieving vibration free piping in the design phase of a subject. An extensive appendix includes the history and derivation of piping flexibility analysis, derivation of acoustic vibration formulas, and various charts and tables.

HEATING VENTILATING AIR CONDITIONING GUIDE for 1956. Published annually by the American Society of Heating and Air Conditioning Engineers. 1176 pages. Illustrated. Blue cloth bound, 6 × 9 inches. Price $12.00. For sale by Nickerson & Collins Company, Chicago, Ill.

In this 34th edition the chapters are substantially changed; some new, others being almost completely rewritten. Particular attention has been given to the presentation of heat transmission coefficients of building materials. An important result is that the design values for conductivity and conductance are included for many more materials than in any other previous Guide. More tables make it easy to compute the effect of adding air spaces or insulations to walls, ceilings or floors.

Other material which has been rewritten is that concerned with automatic control and a description of current control equipment.

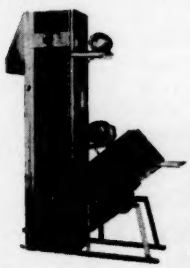
The technical data continues to be presented in 53 chapters grouped under seven sections as follows: I. Fundamentals, II. Human Reactions, III. Heating and Cooling Loads, IV. Combustion and Consumption of Fuels, V. Systems and Equipment, VI. Special Systems and VII. Instruments and Codes. Retained also are the edge indexes for the Technical and Catalog Data Sections. As in earlier editions of the Guide, the 24 × 32 inch ASHAE Psychrometric Chart is included.

The Guide is the result of the efforts and contributions of many engineers as well as data drawn from all available authoritative sources. Much of the information is the result of work conducted in the Society's own Research Laboratory under the direction of the Committee on Research with the assistance of advisory committees.

BATEMAN EQUIPMENT SAVES TIME and LABOR

BATEMAN SHAKER-SIZER

One man can keep unit in operation bagging and loading magazine.

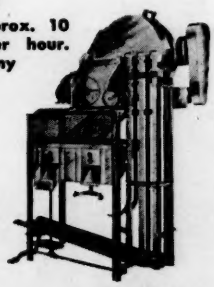


BATEMAN ELEVATOR

will deliver approx. 10 tons of ice per hour. Works with any Crusher.

BATEMAN LOADER-CRUSHER

Crusher ice unit saves time and labor costs. One man can do work of two. Storage bin under crusher will hold 100-lbs. of ice.



Bateman

Ice Processing Equipment

MINERAL WELLS, TEXAS

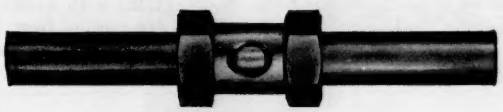
SEE YOUR DEALER or WRITE FOR INFORMATION

LIQUID EYE®

POSITIVE SEALING INDICATORS FROM THE SMALLEST TO THE BIGGEST

MIDGET SIZES 1/4" or 3/8" Line

There is no job too large or too small for LIQUID EYE. There is a unit available for the smallest air conditioner or refrigerator to the largest size Commercial Installation in operation today.



GIANT SIZES thru 1-5/8" Line

Here's why almost 1,000,000 Liquid Eye Indicators have been sold to date.

Spring loaded gaskets for positive sealing • unrestricted full-line flow • pyrex glass, double sealed at sides and ends, provides instant check of refrigerant condition • guaranteed to 500 psi. • precision made.

Sold by leading wholesalers everywhere.
Send today for Catalog D-55 containing the complete Liquid Eye line.

Allin

ALLIN MANUFACTURING CO.
410 N. Hermitage Ave. • Chicago 22, Illinois
Over 1,000,000 Liquid Eyes Sold to Date!

ASRE Annual Meeting

(continued from page 24)

Officers and Directors

Officers and Directors were elected and installed as follows: President, Carlyle Ashley, Syracuse, N. Y.

Vice-presidents, Hermann F. Spoehrer, St. Louis, Mo.; Cecil Boling, West Hartford, Conn.

Treasurer, Daniel D. Wile, Los Angeles, Calif.

Directors: Everett Palmatier, Syracuse, N. Y.; John Engalitchiff Jr., Baltimore, Md.; Robert G. Werden, Philadelphia, Pa.; Charles T. Hamilton, Vancouver, B. C.

Freezing Not Manufacturing

THE United States Supreme Court in reversing a lower court decision has held that the dressing and freezing of poultry is not a manufacturing process because it doesn't really change the basic product. The decision is important because it knocks out the Interstate Commerce Commission's contention that it can regulate shipments of frozen dressed poultry and prohibit shipments by other than ICC licensed carriers.—NARW QUICK SHEET.

Frozen Foods Warehouse

FROZEN Foods, Inc., which will operate under the name of Frostyaire, will construct a commercial storage warehouse at Searcy, Ark. with approximately 30,000 feet of floor space, to cost $200,000. George Bell of Searcy has been named general manager. Curtis Walker, president of the Searcy Industrial Development Council, said the plant will operate on a storage-rental basis, and will handle bulk frozen foods and other cold storage products.

Foreign Market Program For Poultry and Eggs

THE U.S. Department of Agriculture anounces that it has entered an agreement with the poultry industry to expand foreign markets for United States poultry, eggs, and their products. The program will be conducted under an agreement between the Department and the Institute of American Poultry Industries of Chicago, Ill., representing the principal national poultry organizations. These organizations are the Poultry and Egg National Board, the National Turkey Federation, the National Broiler Council, the American Poultry and Hatchery Federation, and the American Feed Manufacturers' Association.

The agreement provides for surveys of the problems and possibilities of developing new markets for poultry, eggs and their products in foreign countries. On the basis of these surveys, projects placing special emphasis on sales promotion, distribution of educational materials, market research and related activities will be developed and carried out. The program is being made possible through use of local currencies available under Title I of Public Law 480. Under this Act, a portion of such currencies received in payment for United States agricultural commodities may be used to develop new markets abroad for such commodities.

Fire Damages Ice Arena

A FIRE of undetermined origin caused extensive damage to one wall of the Ballard Ice Arena, Seattle, Wash. The fire broke out in the wall separating the ice rink from a coffee shop. The building rapidly filled with smoke and vapor, the latter coming from the melting ice. The building is an old Ballard landmark.

Report on Regional Cold Storage Holdings

A REPORT on regional cold storage holdings has been issued by the Agricultural Marketing Service of the United States Dept. of Agriculture. End of month stocks of various commodities are listed according to their geographic distribution during the 1955 calendar year. The purpose of this summary is to provide a ready reference for those interested in the national holdings of foodstuffs reported each month in the Cold Storage Report. Data for those monthly reports are collected from public, private and semi-private warehouses, which include specialized warehouse facilities such as fruit houses and meat-packing plants. Commodities in space owned or leased and operated by the Armed Services are not reported.

Seafood Plant Sold

GENERAL Seafoods Ltd., a subsidiary of General Foods Corporation announced it has arranged to sell its Halifax seafood processing plant to National Sea Products Ltd. The price was not disclosed. The facilities are located in quarters leased from the National Harbors Board of Canada. The sale was to become effective July 1.

Michigan Amends Personal Property Tax Law

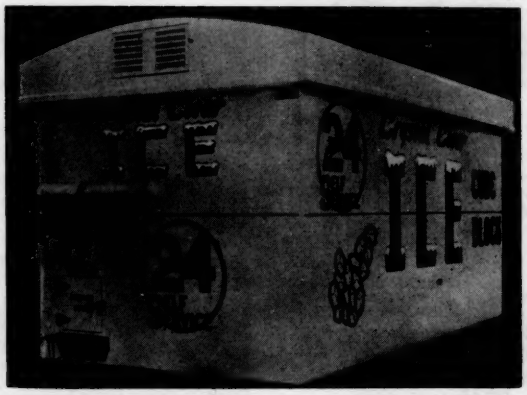
THE STATE of Michigan has amended its personal property tax law to exempt all merchandise stored-in-transit. The new law provides exemption for all merchandise in storage on January 1 of any year which is in fact stored in transit and designed for a point outside the state. A special section of the law exempts all agricultural products.

K. G. Brown Mfg. Co., Inc.
Mattituck, N.Y.

PRESENTS:

The Most Modern Automatic Ice Cube Vendor.

- **Dispenses Cube, crushed, party and block ice**
- **Ready for immediate operation.**



The 8' x 16' station pictured here, vends 135 10-lb. bags & 60 25-lb. blocks

The new low-cost 6' x 8' station vends more than 85 ten-lb. bags.

Write today for complete details on this Double Unit and other sizes and models.

News of PEOPLE

New York Warehousemen Honor J. R. Shoemaker

A LUNCHEON in honor of J. R. Shoemaker, president of the Hygeia Refrigerating Company, Elmira, N. Y., who has completed fifty years in the refrigerated warehousing industry, closed the 43rd annual meeting of the New York State Association of Refrigerated Warehouses May 11, at the Mark Twain Hotel, Elmira, N. Y.

Mr. Shoemaker was presented a flag that has been used on the U. S. Capitol Dome through Rep. W. Sterling Cole (R-NY) of Bath. Other presentations included a scrapbook of letters from former national association executive committeemen and a pair of binoculars from the state group.

Richard Doncaster, Holley, N. Y. introduced Mr. Shoemaker at the luncheon and Wm. Dalton, executive vice-president of the National Association of Refrigerated Warehouses, presented the scrapbook. Francis H. Blake of Albion was luncheon chairman.

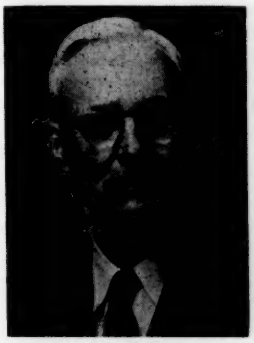
Queensen Appointed St. Louis Manager

KENNETH R. QUEENSEN has been appointed manager of the Merchants Refrigerating Company's new refrigerated warehouse at Vinita Park, St. Louis Co., Mo. The warehouse is expected to be completed and ready for operation by mid-summer. Mr. Queensen is well acquainted with the trade and their requirements in the St. Louis area. He was employed by the company in 1950 as traffic clerk in the St. Louis warehouse at Lewis & O'Fallon Sts., and in 1951 left the company to put in two years of military service. He returned to Merchants in March 1953, and has been the company's St. Louis sales representative since his return.

SCOTT ROSENBERG has been promoted to the post of general superintendent of Alford Refrigerated Warehouses, Inc., Dallas, Tex. Formerly in charge of Alford's old Broom Street plant, Mr. Rosenberg began his career with Alford in 1948, after service with the Air Force. Harold Jones has been advanced to the post of superintendent of dry storage and John Beck has become dry storage chief.

Moss Retires

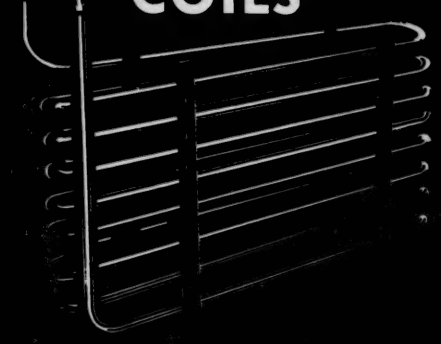
J. F. Moss recently retired from the York Corp., after having served the corporation for more than forty years. Prior to his retirement he was manager of the York, Dallas



J. F. Moss

Branch. Mr. Moss is well known throughout the refrigeration industry and especially to the many ice manufacturing plants throughout the country. His many friends will be interested in learning that he plans to practice consulting engineering in Dallas. He is a member of the A.S.R.E. and the Dallas Chapter of the N.A.P.R.E.

REFRIGERATION COILS



NATIONAL REFRIGERATION COILS have been known since 1883 for the smooth bends, perfect welds and accurate measurements which result only from experienced engineering and exact production.

NATIONAL QUALITY guarantees effective service in all types of NATIONAL COILS, also NATIONAL HEATERS, CONVERTERS & HEAT EXCHANGERS.

NATIONAL QUALITY

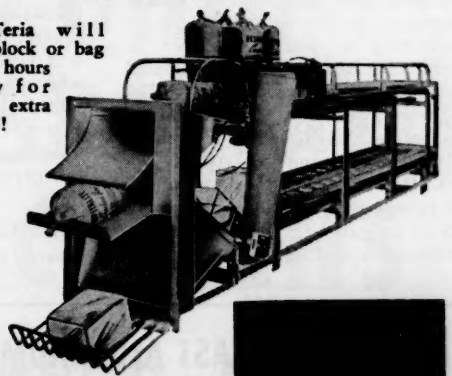
NATIONAL PIPE BENDING CO.

NEW HAVEN, CONN.

ICE-A-TERIA

ICE VENDORS FOR EVERY REQUIREMENT

Ice-A-Teria will vend block or bag ice 24 hours a day for those extra SALES!



NEW BAGGER-WEIGHER

Model 150-B, designed for fast operation, the twin spouts let, the operator remove one bag and replace with an empty. The second bag on the weighing platform has filled, the weight has stopped the machine. The minute the operator removes the filled bag, the scales move upward and starts the mechanism filling the second bag. The operator has only to move the flap in the dividing head the second he has installed the empty bag, this must be done before removal of full bag.

Model 150-B

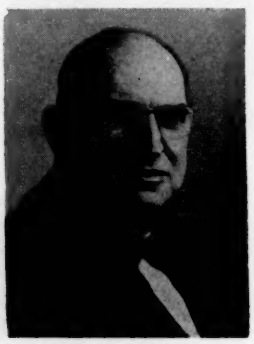
PERFECTION Ice Scoring Machine Co.

P.O. Box 2140
Fort Worth, Texas

DEATHS

George B. Bright

THE DEATH of George B. Bright, known throughout the refrigerating industry as a contractor and consulting engineer with offices in Detroit, occurred June 2, while he and Mrs. Bright were on their way from Cocoanut Grove, Florida, where he had been living in semi retirement, to the Annual ASRE meeting at Cincinnati. He was 73.



George B. Bright

Mr. Bright was a consulting engineer with offices at 2615 Twelfth Street, Detroit, and president of the Detroit Ice Machine Company, Detroit. He was a member of the Board of Rules of the Department of Buildings and Safety Engineering of the City of Detroit since 1924; past president and life member of the American Society of Refrigerating Engineers; a charter member of Michigan Chapter No. 1, National Association Practical Refrigerating Engineers; one of five honorary members of NAPRE; and a member of the Engineering Society of Detroit. He was the author of numerous papers at conventions, also many articles prepared for INDUSTRIAL REFRIGERATION and other trade papers.

He started his career as operator of a small ice making plant and grist mill at Staunton, Va., in 1897 at the early age of 14 years, continuing until 1904 when he began work as an erecting engineer for the Frick Company. In 1906 he started as an erecting engineer for the Fred W. Wolf Company of Chicago and remained with this company until 1912 when he joined Huetteman and Cramer Company of Detroit. In 1916 he organized the Detroit Ice Machine Company, refrigeration contractors and the following year organized the George B. Bright Company, consulting refrigeration engineers.

Mr. Bright attained a leading position as a consulting refrigeration engineer without benefit of a formal engineering education. He attended a rural school from 1890 to 1897 and the balance of his education came, as he described it, the hard way. He subscribed to various correspondence courses and pursued self-education gained from practical experience and association with various members of his organization and the industry.

He was one of the principals in organizing the Midwest Engineering & Equipment Co., Chicago in 1920, the National Ice Co., Detroit in 1924 and the Good Humor Ice Cream Co., Detroit in 1927. He was a member of the committee on Fundamental Equipment of the President's Conference on Home Building and Home Ownership, 1931-1932. He was a pioneer in raw-water ice-making, his first venture being at Staunton, Va., where the can ice plant was changed into a plate system, being one of the first in the country. He was granted numerous patents in connection with refrigeration apparatus and applications.

The George B. Bright Co. has occupied an unusual position in the refrigerating field, particularly ice plants and cold storages, having designed and built or remodeled over 300 ice plants in the middle west in the peak record from 1917 to 1932. Since repeal of prohibition the company had an active part in the rehabilitation of breweries.

He leaves his widow, Mrs. Elizabeth Bright, two daughters, one son, George B., Jr., and two grandchildren.

Charles C. Small

THE DEATH of Charles Carleton Small, retired president and board chairman of the American Ice Company New York, occurred May 21 in a Biddeford, Maine hospital after a brief illness. He was 79 years old. He was born in Kennebunkport, Maine, and had lived in New York from the age of 14 until his retirement ten years ago.

Mr. Small had been director of the Coca-Cola Bottling Company, president and director of the Knickerbocker Laundry Company and chairman of the Ice Refrigeration Company, Inc., all of New York. He was an active member and a former president of the National Association of Ice Industries and served for many years as a Director, a member of New York State Chamber of Commerce, and during NRA days was a member of the National Ice Code Authority. Surviving are his widow, two daughters and a sister.

Frank C. Obert

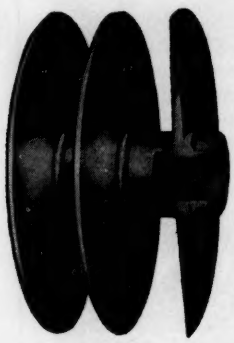
THE death of Frank C. Obert of Nutley, N. J., greater New York area sales manager for the Kramer Trenton Co., Trenton, N. J. occurred recently of a heart attack. Mr. Obert, was 59 years old. He was active in ASRE affairs, and was the author of several manuals on "Freon" and methyl chloride refrigeration applications.

DIMCO CAST ALUMINUM FIN EVAPORATING COIL

The Ideal Refrigeration Surface for Cold Storages, Freezer Plants, Dairy Products, Packing Houses, Abattoirs, Breweries and numerous applications

DETROIT ICE MACHINE COMPANY

2615 Twelfth St., Detroit 16, Mich.



★ *Saves Space*

★ *Saves Weight*

★ *Saves Cost*

CAN BE USED WITH ANY REFRIGERANT

Write For Descriptive Folder

MANUFACTURERS' NEWS

Jamison Observes Fiftieth Anniversary

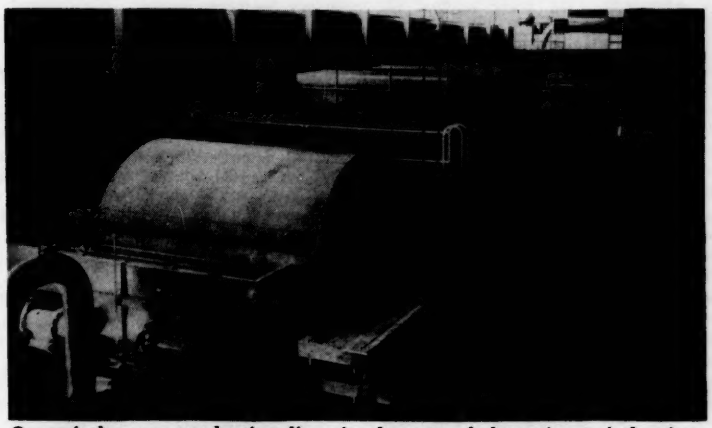
J. V. Jamison III.

THIS year the Jamison Cold Storage Door Company, Hagerstown, Md., is 50 years old. To commemorate the event, a handsome booklet, measuring 10¼ x 13⅞ inches, replete with illustrations, has been distributed. The beginning of this company, says the booklet, was in a small barn-like structure in 1906. Five workmen were employed. Now a modern plant covers nearly four acres under roof. Illustrations include a panoramic exterior of the plant, numerous photographs of personnel, and views throughout the offices and plant, showing stages of production from start to finished doors and application of Jamison doors in various industries. The booklet tells a connected and complete story about this important company.

Armstrong Opens New Fiberboard Mill

PRODUCTION of Temlok fiberboard products at the Armstrong Cork Company's newly expanded facilities at Macon, Ga. has been started and a progressively larger volume of manufacture is scheduled until full capacity is realized late this summer, H. R. Peck, vice-president and general manager of Armstrong's Building Materials Operations, has announced.

"While it will take some time before the full impact of these new facilities will be realized on all Armstrong fiberboard products now in short supply, we anticipate rapid improvement in the supply of a num-

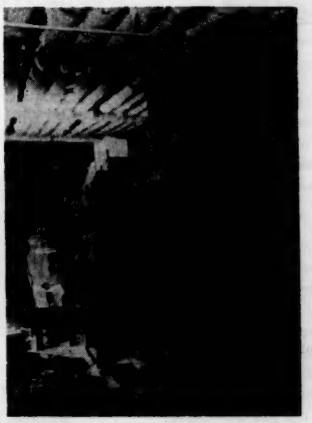


One of the new production lines in the expanded portions of the Armstrong Cork Company's fiberboard mill at Macon, Ga. Production was started on the new equipment early in May.

New LABOR-SAVER

ESKIMO AUTOMATIC LOADER CRUSHER BAGGER

Lends itself to a variety of applications to fit your particular plant requirements.



This new 3-way combination includes: Eskimo Model 200 Weigher-Bagger; Eskimo Model 450-P Ice Crusher, and Eskimo Automatic Loader.

Write for full details

BALLARD SALES COMPANY

PO Box 1121, Fort Worth, Texas

Phone EDison 2-3216

OHIO SPECIAL ICE CANS

WELDED — RIVETED

ICE CAN GRIDS

Industrial Trucks and Trailers

THE OHIO GALVANIZING & MFG. CO.

NILES OHIO

ber of them to our dealers and customers," Mr. Peck said.

Production with the new facilities got underway less than a year after ground was broken for construction in July of last year. The capacity of the original Armstrong fiberboard plant at Macon, which was completed in 1948, is being more than doubled so that it is now one of the largest fiberboard mills in the world. During the period of expansion, production continued on the original equipment, so that little or no output was lost as the new facilities and equipment were being readied for production.

The Macon Plant, along with the Company's other fiberboard factory at Pensacola, Flordia products a line of building products serving primarily structural, insulating, acoustical and decorative functions. Among the products produced at the Macon Plant that have been in extremely short supply, necessitating an allocation program for their distribution, are Temlok Roof Deck, Temlok Sheathing and Cushiontone acoustical tile.

The new Macon facilities not only will result in more than double the previous Armstrong capacity for the production of fiberboard products but the plant incorporates a number of improved principles developed by Armstrong research and engineering in recent years, according to Mr. Peck. Mr. Peck said that the "expansion reflects the growing trend, all over the nation, toward building methods and designs which demand fewer conventional building materials and more manufactured products, such as acoustical tile, roof deck and Rain-Shield sheathing, which serve as component parts of a building. We are looking ahead to the development of more and more new products of this type."

The expansion project is adding approximately 212,000 square feet to the 300,000 square feet of floor space in the original facilities. The original buildings have been enlarged and a second board mill set up alongside the existing mill; additional grinding, pulping, screening, forming, drying, fabricating and painting equipment have been installed; the wood yard rearranged, and warehousing and shipping facilities are being approximately doubled.

Burkey Toledo Manager For Creamery Package

LLOYD C. BURKEY has been promoted to manager of the Toledo, Ohio, sales branch of The Creamery Package Mfg. Company, according to a recent announcement from CP vice president J. L. Brazee. Mr. Burkey succeeds the late A. E. Meister, who died of a heart attack on May 3. Mr. Burkey is a graduate from Ohio State University where he received a B. S. degree in dairy technology. He joined Creamery Package Toledo Branch sales staff in 1940. He was made branch sales engineer in 1942, and was promoted to assistant branch manager in 1949. He is a member of Tri-State and Maumee Valley Dairy Technology Societies.

Lloyd C. Burkey

Air Conditioning Cools New Caterpillar Plant

THE administration building, metallurgical laboratory, cafeteria and offices of the new Decatur, Illinois, Caterpillar Tractor Co., plant, part of a 200 million dollar expansion plan, are cooled by a 350-ton plant. A week long "open house" celebration followed the formal opening of the new facility on May 21 which will be used for manufacturing earth moving equipment.

In dedicating the new plant, President

Harmon S. Eberhard
President, Caterpillar Tractor Co.

H. S. Eberhard said that the company's faith in the future needs of the nation and world indicated the necessity for providing for increased production and as evidence of these trends, he pointed out that

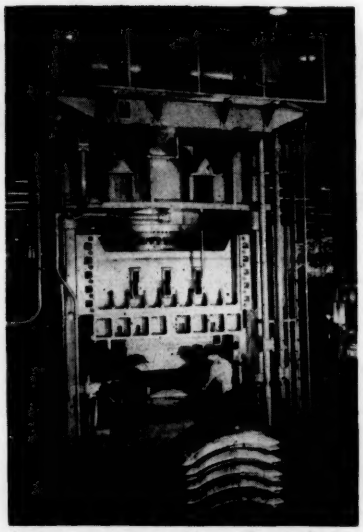
1. Our school facilities will need to be almost doubled in the next few years. In America today, there are almost 70 per cent more children under five years of age than we had in 1940.

2. We will need more highways and better highways — safer highways. Today's roads are carrying about 55 million cars and trucks — 72 per cent more than in 1940. They just were not designed to carry that amount of traffic safely.

3. We must rebuild or remodel a great many of our residences. 67 per cent of our homes are over twenty years old; 50 per cent are over thirty years old.

4. We must rebuild and modernize large sections of many of our cities. Cities like Pittsburgh, Los Angeles, and St. Louis have already taken positive steps in this direction.

5. We need to expand our entire private hospital system. The increase in civilian hospital beds has fallen steadily behind our growth in population.



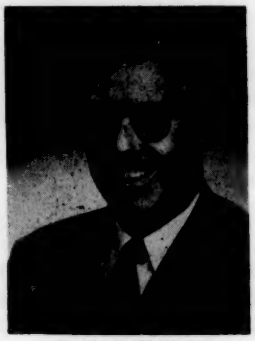
Heavy gauge steel is formed for wheel tractor fenders in 3,000 ton hydraulic press with six million pounds per square inch capacity.

6. We must modernize much of industry — to replace industrial equipment that has become obsolete, outmoded or inadequate.

"In brief, we're living in a country that needs more of practically everything that contributes to the well-being of its people — more schools, more highways, more homes, more hospitals, more productive capacity."

Acorn Wire & Iron Opens West Coast Office

THE ACORN Wire and Iron Works of Chicago and New York announced recently the affiliation of S. Averell Cole as sales manager for the Western Division. Mr. Cole will be opening a Western Division office in July 1956 to be located



S. Averell Cole

in Los Angeles. He is a member of the Chicago Chapter of NAPRE and is NAPRE's National Chairman for Industry Relations. He is a former National Director and past president of Chicago Chapter. He was formerly Supervisor of Perishable Transportation for Preco, Inc., of Los Angeles.

CATALOGS AND BULLETINS

Thermo Panel Coils

UP TO the present time there has been no authentic technical information on Dean Thermo-Panel Coils in engineering handbooks, text books, or elsewhere. There has therefore been a demand for a dependable treatise making clear the advantages of these coils. This need has been met in Bulletin 355 with 52 pages

issued by Dean Products, Inc., Brooklyn, N.Y., containing a complete description of this equipment. Photographs of coils and assemblies further clarify their operation. On the back cover is a list of 34 typical applications.

Bulletin on Drying

A NEW two-color brochure describing new 'Surface' high speed, low-temperature dryers for continuous drying processes has been issued by Air Conditioning and Drying Division, Surface Combustion Corp. Toledo, Ohio. Continuous dryers replace batch operation in production of glue and gelatin dairy products.

Steam-Jet Cooler Bulletin

A 24-PAGE bulletin, in color, covering the current line of steam-jet water cooling units has been released by Ingersoll Rand Company, New York. For supplying commercial quantities of chilled water at temperatures as low as 35 F, this type of unit has many advantages as outlined in the bulletin. A series of diagrammatic illustrations in color is used to show how typical steam-jet coolers operate. A complete listing of range of sizes available, together with approximate dimensions, make this bulletin of considerable value to anyone requiring chilled water for processing or air conditioning applications. Units are available in sizes from 30 to 1200 tons of refrigeration.

A complete description of the various component parts and auxiliaries is included. Of special importance is the section on automatic controls, especially the "Steam Sav-IR" which is designed to reduce operating costs on installations subject to varying condensing water temperatures. Three pages of installation photos show the wide range of applications and the adaptability of this equipment to suit varying installation requirements.

Bulletin on Vibration

NOW AVAILABLE from Vibration Mountings, Inc., Corona, New York is a new bulletin on vibration isolation especially designed for heating, ventilating and air conditioning refrigeration equipment. The folder outlines in detail the various methods available for preventing transmission of vibration from these types of equipment. Since Vibration Mountings, Inc. designs and manufacturers a complete range of isolation materials, this company is in a position to make impartial recommendations for installations to fit varying needs.

A chart of theoretical material isolation efficiencies based on R. P. M. is included, as well as outline recommendations for isolating centrifugal compressors, reciprocating compressors (V-W type), air handling units, centrifugal fans and centrifugal pumps. Also included are recommendations for isolating self-contained air conditioning units, cooling towers, boilers, induced or forced draft fans, piping and special applications on which Vibration Mountings, Inc., is equipped to furnish special designs. A chart of recommended isolation efficiencies for both non-critical and critical locations is included.

New Catalog on Evaporative Condensers

THE BALTIMORE Aircoil Company Baltimore, Md. has published a 12-page catalog on their new "MC" Line of heavy duty evaporative condensers. The catalog covers the complete line, 22 sizes from 10 to 350 tons, for Freon 12, Freon 22 and Ammonia. The construction and components of the units are described in detail, utilizing illustrative photographs. Very complete selection data, plus detailed dimensional drawings, is also included. The B.A.C. Model "MC" Evaporative Condensers, feature a new sectional construction.

Bulletin on Tubing

ENGINEERS and others involved with the design, maintenance or repair of condensers and heat exchangers will receive benefits from the information and data contained in the six-page technical folder which has been released by the Tubular Products Division of The Babcock & Wilcox Company, Beaver Falls, Pa. This bulletin, identified as TB-412, emphasizes the quality, dependability and economy of electric resistance welded carbon steel tubing in applications involving heat transfer.

Classified Advertising

All classified advertisements are payable in advance. RATES: 20c per word; minimum 25 words. $2.00 Except for Positions and Help Wanted classifications, per line for bold face headings; $15.00 per inch for this section is reserved exclusively for USED equipment. line listings.

USED EQUIPMENT—wanted & for sale

FOR SALE — Refrigeration equipment; ice equipment; new, used. Advise us your needs. Use "QUICKSEAL" — stops brine tank leaks; easy, efficient, economical. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois, WAbash 2-3299.

FINNED PIPE FOR SALE—61 lengths 12' each. Made from 2" steel pipe-7" square fins 1½" apart; galvanized. New at only $3.00 per foot. Also 100 steel Hand Trucks. Medium duty; roller bearing wheels. New at $6.00 each. West Side Cold Storage Co., 7 Harrison St., New York 13, N.Y.

WANTED—4x4 or 5x5 York or Frick compressor V belt drive with A.C. motor, in first class operating condition. Clinton Ice Mfg. Co. Inc., Att'n. H.R. Turlington, Clinton, North Carolina.

FOR SALE
2—10"x10" 2 cyl. Frick D.C. to 100 hp motor.
2—10"x10" 2 cyl. York D.C. to 100 hp motor.
3—9"x9" 2 cyl. York D.C. to 75 hp motor.
1—8"x8" 2 cyl. Frick D.C. to 75 hp motor.
1—7¾"x5" Frick booster.
2—50 ton G.E. Freon condensing units.
1—50 ton Buffalo Freon evap. condenser.
1—6"x6" Frick compressor.
1—5"x5" York compressor.
3—9¼x14" 115 hp Wolverine Diesel engines.
11x22x47" and 11x22x51" ice cans.
Ice plant — 20 to 160 tons.
ENTERPRISE EQUIPMENT CORPORATION
77 Alexander St. Yonkers, N. Y.
Cable ENEQCO Phone: Yonkers 8-8118-9

FOR SALE—AMMONIA—FREON
1—3-¼x3"—8 cyl. V/W York belt driven ammonia compressor.
1—5¼"x4¼"—6 cyl. V/W York ammonia booster comp.
1—6-¾"x5"—6 cyl. V/W York booster ammonia comp.
1—25 ton Chrysler Air Temp. Freon condensing unit, complete.
1—40 ton General Electric Freon condensing unit, complete.
1—50 ton General Electric Freon condensing unit, complete.
1—50 ton Buffalo Freon evaporative condenser.
ENTERPRISE EQUIPMENT CORPORATION
79 Alexander St. Yonkers, N.Y.
Cable: ENEQCO Phone Yonkers 8-8118-9

FOR SALE—4x4, 5x5, 10x10 Fricks, 5x5, 8x8 Yorks, splash lubrication. 7½ and 9" York crank shafts. Write E. Niebling, 1546 St. Clair Carolina.
Ave., Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE
9x9 York V-belt drive 75 h.p. motor.
7½x7½ York V-belt drive to 50 h.p. motor.
6x6 York D-8 30 h.p. motor.
5x5 & 4x4 Yorks with condensers.
B.A.C. Model 25U evaporative condenser.
(2) 8 KW MG sets.
130 h.p. 600 r.p.m. Diesel engine.
50 h.p. motor 670 r.p.m.
FREON EQUIPMENT
300 h.p. York Turbo compressor with water chiller, condenser, etc.
50 h.p. Chrysler Airtemp air conditioning set-up — 10 h.p. condensing unit w/air units.
JOHN F. CARSON
"A" & Venango Sts. Philadelphia 34, Pa.
GArfield 6-2221

TESTS SHOW YOU'RE SAFER with ACME

.... the Gas Mask that Gives You MAXIMUM USABLE VISION

Vision-scope tests made with leading industrial gas masks prove that ACME Full-Vision gas masks lead the field in giving the wearer clear, undistorted vision — — up, down, and to either side. Along with maximum usable vision, the ACME provides greater comfort, less fogging, minimum breathing resistance and acceptable conversation transmission — — all at down-to-earth prices.

Write for Bulletin No. 562 on Vision-scope tests and No. 541 on Gas Masks.

ACME PROTECTION GUIDE LISTS 433 GAS HAZARDS AND HOW TO OVERCOME THEM

This practical guide is a must for anyone exposed to the hazards of ammonia and other dangerous gases, mists, fumes, smokes and dusts. It not only lists 433 hazards, but also indicates the ACME gas mask equipment designed to overcome them.

Write for Bulletin No. 542.

ACME PROTECTION EQUIPMENT COMPANY

1211 Kalamazoo St., South Haven, Mich.

PIPE BENDS & COILS

The "know-how" of nearly 40 years of specialization in pipe fabrication back every job produced by our master metalworkers. You can confidently entrust your work to us. . . even stainless steel, or up to 6-inch extra heavy. Complete welding facilities.

May we quote on your next job.

CHICAGO NIPPLE MANUFACTURING CO.

1997 CLYBOURN • CHICAGO 4

FRED OPHULS & ASSOCIATES

Consulting Engineers

112-114 West 42nd St. New York City 36

Industrial Power Plants

Refrigeration and

Cold Storage Warehouses,

Reports, Appraisals and Management

VAN RENSSELAER H. GREENE

ENGINEERS

COMPLETE PLANT DESIGNS INCLUDING BUILDING AND EQUIPMENT

11 PARK PLACE NEW YORK 7, N. Y.

ADVERTISERS

Acme Protection Equipment Co.	64
Alco Valve Co.	37
Allin Mfg. Co.	57
American Hair & Felt Co.	9
Armour & Co.	27
Armstrong Machine Works	53
Ballard Sales Co.	61
Barada & Page, Inc.	12 and 55
Bateman Foundry and Machine Co., Inc.	57
Brown Mfg. Co. Inc., K. G.	58
Butcher Boy Refrigerator Door Co.	1
Chemical Solvent Co.	6
Chicago Nipple Mfg. Co.	64
Classified Advertising	63
Dersch, Gesswein & Neuert, Inc.	43
Detroit Ice Machine Co.	60
Enterprise Equipment Corp.	63
Frick Co.	51
General Chemical Div. Allied Chemical & Dye Corp.	41
Gifford-Wood Co.	49
Greene, Van R. H.	64
Howe Ice Machine Co.	5
King Co. of Owatonna, The	52
Kramer Trenton Co.	10
Link-Belt Co.	47
National Pipe Bending Co.	59
Nitrogen Div., Allied Chemical & Dye Works	Back Cover
Ohio Galvanizing Mfg. Co., The	61
Ophuls & Associates, Fred	64
Owens-Corning Fiberglas Co.	Inside Back Cover
Perfection Ice Scoring Machine Co., The	59
Phillips & Co., H. A.	8
Pittsburgh-Corning Corp.	32 and 33
Presstite-Keystone Engineering Products Co.	39
Refrigeration Engineering Co.	52
S & S Vending Machine Co.	53
Taylor Instrument Companies	2
Texas Co.	Inside Front Cover
Wanted and For Sale Advertising	63
York Corp.	7

To the man in a *"PUZZLEMENT"* about Cold Storage Insulation!

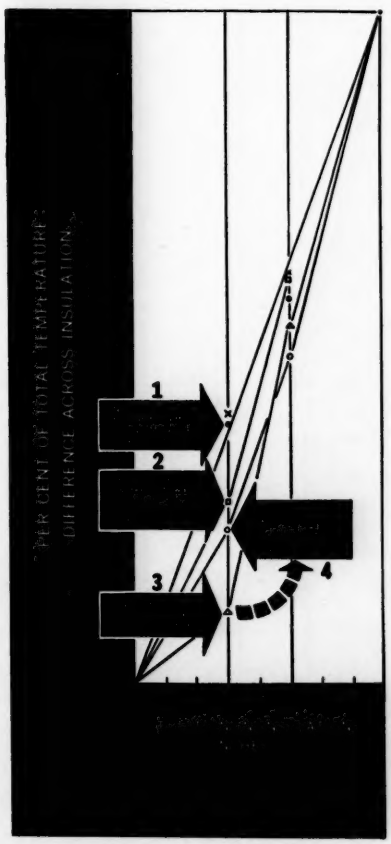
If you are wondering whether you'll get better performance from Fiberglas* PF Dry Wall Construction, we urge you to read a report on what is possibly the best authenticated field test ever made on a cold storage insulation.

The locale was the Mid-South Refrigerated Warehouse Co. plant** in Memphis, Tenn. The noted testing engineers, who prepared the report, were Elmer R. Queer, ASRE and E. R. McLaughlin, ASRE. Their paper in *Refrigerating Engineering* for January 1956 makes these two important points:

1. Fiberglas PF Dry Wall is giving "*an overall thermal performance consistent with, or better than, results anticipated by calculation.*"
2. If moisture accidently enters a Fiberglas PF Dry Wall installation, it *migrates into the room* . . . leaving the insulation as dry and efficient as when installed. This statement is supported by thermal readings taken in a moist area caused by rain which fell during construction.

The significant thermal readings referred to above are shown in the chart at the right. For a reprint of the complete article, please write Owens-Corning Fiberglas Corporation. Dept. 165-G, Toledo 1, Ohio.

** *(Designed by A. Epstein and Sons, Inc., Chicago, Ill. Engineers and Architects.)*



It's amazing the difference Fiberglas makes!

OWENS-CORNING FIBERGLAS

*T.M. (Reg. U. S. Pat. Off.) Owens-Corning Fiberglas Corporation

Call Your Distributor a

DOUBLE SERVICE

● CONTACT your distributor (listed below) for *fast* delivery of Barrett Standard Anhydrous Ammonia in cylinders.

CALIFORNIA
Los Angeles: Nitrogen Div. Allied Chemical & Dye Corp. 2999 West 6th St.
San Diego: Gould Hardware & Machinery Co. 700 E. Harbor Dr.
San Francisco: Nitrogen Div. Allied Chemical & Dye Corp. 1095 Market St.

COLORADO
Denver: Mine & Smelter Supply Co. 1422-17th St. P. O. Box 5270

CONNECTICUT
W. Hartford: The Christian Petersen & Son Co., 26 Brook St. P. O. Box 247

FLORIDA
Jacksonville: D. W. Anderson 615 E. Bay St. P. O. Box 1346
Miami: Columbia Chemical & Supply Co., 7430 N.E. 4th Ct. P. O. Box 967
Tampa: Food Equipment & Supply Co., 1809 2nd Ave. P. O. Box 422

GEORGIA
Macon: The Anderson Chemical Co., Inc., 1620 Waterville Rd. P. O. Box 1424

ILLINOIS
Chicago: Westland Engineering Supply Co., 53 W. Jackson Blvd.

IOWA
Burlington: McKesson & Robbins, Inc., West Central District Off. 100 N. 4th St. P. O. Box 591
Cedar Rapids: McKesson & Robbins, Inc., Cedar Rapids Div. 900 2nd St., S.E.
Ottumwa: J. W. Edgerly & Co. 120 W. Main St.
Sioux City: McKesson & Robbins, Inc., Sioux City Div. 308 Pearl St.

KANSAS
Wichita: Reid Supply Co. 306 W. 2nd St.

KENTUCKY
Henderson: P. B. & S. Chemical Co. 1100 N. Adams St.
Louisville: Griffin Chemical Co. 528 Franklin St.

LOUISIANA
New Orleans: Sam Reisfeld & Co. 403 Queen & Crescent Bldg.

MAINE
Portland: Acme Engineering Co. 46 Market St.

MARYLAND
Baltimore: Leidy Chemicals Corp. 920 S. Eutaw St.

MASSACHUSETTS
Attleboro: Reynolds & Markman, Inc., 88 Union St.
Springfield: The Chemical Corp. 54 Waltham Ave.
West Springfield: Barker Chemical Co., 101 Circuit Ave. P. O. Box 173
Worcester: Brewer & Co., Inc., Ind. Chem. Div., 45 Arctic St.

MICHIGAN
Detroit: Eaton Chemical & Dyestuff Co., 1490 Franklin St.

MINNESOTA
St. Paul: Lyon Chemicals, Inc. 2305 Hampden Ave.

MISSOURI
Kansas City: Abner Hood Chemical Co., 507-517 N. Montgall Ave.
St. Louis: Nitrogen Div. Allied Chemical & Dye Corp. 4528 South Broadway
St. Louis: McKesson & Robbins, Inc., Chemical Div., 904 Landreth Bldg., 320 N. 4th St.
St. Louis: G. S. Robins & Co. 126 Choutesu Ave.

NEBRASKA
Omaha: McKesson & Robbins, Inc. Omaha Div., 902 Farnam St.

NEW JERSEY
Edgewater: Nitrogen Div. Allied Chemical & Dye Corp. 1 River Road
Paterson: Lotte Chemical Corp. 109 - 5th Ave.
Paterson: Seaboard Industries 195 Keen St.
Paterson: Wollen Chemical & Supply Co., 126 6th Ave. P. O. Box 1659

NEW YORK
Albany: Albany Laboratories, Inc. 67 Howard St.
Bklyn: Tex-Ite Products Corp. 885 Flatbush Ave.
Buffalo: Commercial Chemicals, Inc. 211 Hertel Ave.
New York: Nitrogen Div. Allied Chemical & Dye Corp. 40 Rector St.
New York: N. H. Heyman, Inc. 168 E. 91st St.
New York: E. M. Sergeant Pulp & Chemical Co., 7 Dey St.
Poughkeepsie: Duso Chemical Co., Inc., Fulton & Fairview St. P. O. Box 665
Rochester: Wm. B. Duffy Carting Co., 62 Scio St.
Syracuse: Gleason Materials & Equipment Co., Inc., 424 Heffernan Bldg., 205 Harrison St.

NORTH CAROLINA
Charlotte: American Cyanamid Co. 3333 Wilkinson Blvd.

OHIO
Cleveland: Harshaw Chemical Co. 1945 E. 97th St.
Cincinnati: Harshaw Chem. Co. 6265 Wiehe Rd.
Cincinnati: Wirthlin-Mann Co. 1930 Dana Ave. P. O. Box 56

OKLAHOMA
Okla. City: Rex Engineering & Sales Co., 2735 N.W. 10th St. P. O. Box 5141
Tulsa: Vaughn Chemical Co. 1102 E. 3rd St.

PENNSYLVANIA
Altoona: Western Pennsylvania Chem. Co., Inc., 4125-41 6th Ave. P. O. Box 703
Pittsburgh: Thomas Knoch 244 Bascom St.

RHODE ISLAND
Providence: T. H. Baylis Co. 42 Gano St.

TENNESSEE
Memphis: The Lilly Co., 466 Union Ave.

TEXAS
Dallas: Chas. H. Platter & Co. Texas Bank Bldg.
El Paso: George S. Thompson Co., Inc., 611-615 N. Campbell St.
Houston: Leatherwood Supply, 205 McKinney
San Antonio: Interstate Brokerage Co., 411 No. Medina St. P. O. Box 4497 Station "A"

UTAH
Salt Lake City: Mine & Smelter Supply Co., 121 W. 2nd St., South P. O. Box 1348

VIRGINIA
Richmond: Phipps & Bird, Inc. 303 S. 6th St.

WEST VIRGINIA
Charleston: B. Preiser Co., Inc. P. O. Box 6118

WISCONSIN
Milwaukee: Benlo Chemicals 1907-25 S. 89th St.

PROMPT DELIVERY of a reliable product is always desirable. And when delivery and reliability are backed up by both your local dealer and a nationwide service force, your service is *doubly good.*

THIS IS WHAT you get when you order Barrett Brand Anhydrous Ammonia. Not only do you get a product made by America's largest producer of high-purity, extra-dry Ammonia, but you get service from a local distributor.

YOUR LOCAL DISTRIBUTOR is an independent firm whose livelihood depends on his personal service to you, backed by the staff, experience and facilities of Nitrogen Division. He can help you solve any technical problems you may have. He will also provide you with the type of service you want. Call him today!

Allied Chemical — NITROGEN DIVISION

40 Rector Street, New York 6, N. Y.

Hopewell, Va. • Ironton, Ohio • Orange, Tex. Omaha, Neb.